

Journal of The Asiatic Society

1850

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JOURNAL

OF THE

ASIATIC SOCIETY.

No. III.—1850.

*Extracts from DR. VOYSEY'S Private Journal when attached to the
Trigonometrical Survey in Southern and Central India, No. II.*

In Vol. XIII. of the Journal, p. 853, will be found the first of these papers, though in point of time the last. The Editor now proposes to complete the series much of which, in connection with the papers published by the late lamented Captain Newbold, will be found of great interest and importance in our present scanty knowledge of the geology of these extensive districts.—Ed.

*Extract from D. H.'s Manuscript.**

The mountainous tracts of which this Peninsula is composed, consist chiefly of primitive formations of which the old trap with all its subordinates is the principal.

The hills in general do not rise to any great perpendicular height, few are higher than 5000 feet and most only 1000 to 1500, and those near the sea 5 to 600 feet.

BME country south of the Krishna may be divided into the eastern
3015 table-land, and the Malabar coast.

The trap formation including the older, later and newest, is the most productive producing gold, diamonds, &c.

The coast between the sea and the mountains is low, although one occasionally meets with slight elevations of 50 or 100 feet.

The general ascent is indeed so trifling that although the ghats are from 50 to 80 miles from the sea, their feet are seldom elevated more

* It is not now known who this gentleman was, but Dr. Voysey, had evidently found this general sketch worth notice and the Editor has thus inserted it also.

No. XXXIX.

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than a few feet above it, this has been determined by actual measurement in the Godavery, Krishna and Cavery.

On the coast of Coromandel the first stratum which meets the eye is a moveable sand, interspersed with black particles of magnetic ironstone, common about Madras and sold in the Bazars under the name of Suranmmely.

Next is found a stiff loam very sterile, extending 2 miles inland, when other alluvia, such as sand, marl, disintegrated calc tuff, and a mixture of sienitic gravel, are seen in alternating strata.

The calc tuff is generally covered by a thick stratum of rich black mould, which appears to proceed from the quick destruction of the vegetables by the calc tuff. The marl is often 20 feet deep, and does not contain animal remains of any kind; rolled hornstone, fragments of sienite and pebbles are found in it. It very often covers the stratum in which the diamond is found.

The acclivities which are found along the coast about Madras and Nellore consist of iron clay used for bricks, Dr. B.'s laterite. The small pebbles or stones in it, resemble floetz greenstone: mica is also found near Pondicherry, and a secondary floetz lime with shells used for paving the streets.

In the vicinity near the sea are found remarkable petrifications of large pieces of trunks and branches of tamarind wood.

Transition limestone is met with in some abundance, and in mountain masses near the Krishna at Chintapally. It might be taken for floetz limestone, but there are animal remains in it. Calc tuff and sienite are found, and a black limestone which burns white. About Lat. 13° 14' N. mountains of transition flinty slate make their appearance 3000 feet above the level of the sea. The Pulicat hills.—They run in uninterrupted ranges from about 15 to 20 miles in the direction of the coast. The hill on which the Tripety Pagoda stands belongs to this rock and it further continues to the banks of the Pennar.

In the branch, south of Cuddappah which runs nearly east and west, I found small veins of plumbago. Sulphuret of lead with a large proportion of silver is found, 15 miles in a N. E. direction:

The flinty slate appears to rest on greenstone slate, which often makes its appearance in the Pallams, the Pulicat hills, and to the northward.

The hills at Vellore and the big and little Mount at Madras, are mostly transition trap.

They consist of a friable mixture of hornblende, felspar, quartz, and mica, with garnets and pyrope with epidote. The hornblende is found in the hills in nodules in concentric layers like basalt.

Under and among these hills, rocks of the old trap rise often in high ranges with acute points. Felspar, hornblende and quartz with a small proportion of mica, pyrope and epidote enter it as foreign minerals. When the latter, particularly garnet, are absent the felspar is red. Of this rock, the generality of the hills on this coast consist. It seems to rest on granite near the seven pagodas: a rare occurrence, the appearance of the granite along the coast. The granite is particularly striking here on account of its freshness, whilst the former is found tarnishing and scaled.

The hornblende which forms a constituent of our primitive trap is in general shining black, and contains iron in so great a quantity as to be attracted by the magnet when in small particles. It is the same in the greenstone and greenstone slate on which the transition flinty slate of the Púicat hills rests. The greenstone of that part of the country exposed to the air becomes green, although it is black, and does not contain a particle of copper.

The brown and hydrous copper of Dr. T. is found here and in some places mica slate with large garnets.

A compact greenstone, foliated and ringing when struck, is used for lingams. Common hornblende of an olive-green is found in the Barmaul in Noorcull, in primitive trap with garnets. A remarkable rock called *black granite* procured near Madras, is common augite rock. It occurs only massive, greenish black, opaque; in small thin pieces, and on the edges in large pieces, olive-green and transparent. Internal lustre resinous, glistening and splendid; fracture foliated and granular and on the whole uneven. A two fold cleavage is observable, it is semi-hard, rather brittle, easily frangible, Sp. Gra. 3. 20. garnets are found in it and basalt. If the latter indistinct grains of a black colour, foliated fracture and less hard than the augite; the former are of a ruby colour.

Another stone found in this part of the country (Madras), I will call compact hornblende, although it differs in many respects from that rock.

Its colour is Olive green with a lighter greenish grey streak; fracture granularly foliated, opaque; lustre glistening on the foliations, for the rest dull. Semi-hard, rather brittle, but difficultly frangible; fragments wedge shaped sp. G. 3. 53. It is perhaps a species of common actinolite.

The Corundum is found frequently in rocks of the old trap formation. The iron which is found accompanying it is common black hornblende. Corundum in rolled pieces occurs in alluvial strata along with the diamond, epidote, greenstone &c.

Among the trap rocks in the southern Baramahl, I have often met with several pieces of actinolite; and near Salem and Namcull in kidneys, native magnesia accompanied with figure stone or agalmatolite.

Of iron ores. I have only found on the coast the common iron sand in the beds of rivers and some swamp ores in the low country.

Besides the abovementioned trap the old clay slate (?) formation occurs and mica slate. The former about the Krishna under transition limestone also with flinty slate on one side and primitive on the other.

Mica slate I have discovered under the greenstone slate near the copper mines.

Extracts from Dr. Voysey's Private Journal.

Friday, 18th November, 1818.—Quitted Paramboor at 11 o'clock, and arrived at the Red hills half past 12. Barometer yesterday at 2 o'clock, 768 m. Ther. 78°: to-day at 2 o'clock same, Ther. 81°. Irregular appearance of the iron clay, sometimes containing large pieces of brown ironstone, but for the most part small, with a considerable quantity of magnetic iron ore. Iron clay formation continues, although covered with a thick bed of sand.

Monday, 16th November, 1818.—The iron clay still continues, but we now and then meet with lumps of quartz and quartz rock, brought to mend the tanks and roads.

Tuesday, 17th November, 1818.—Swam across a considerable stream and found on the banks lumps of fullers' earth lying on a quartz sand intermixed with bits of quartz.

Wednesday, 18th November, 1818.—On the borders of a tank I found a very considerable quantity of the pyriform brown iron stone,

which I also found at intervals all the way to Nyour Choultry, in the neighbourhood of which it is found in large quantity. The iron clay was frequently seen throughout the journey, sometimes containing both large and small pieces and blocks of quartz. On approach to the Choultry we observed a number of smiths at work. The forge and bellows of the usual rude construction; the iron ore is brought from the neighbouring hills: these hills are continuous with those of Naggery Nose Worrámallepett, and appear to be of the same composition; granite at bottom and sandstone at top.

The ore is the slaty red iron ore of mineralogists, and produces tolerable iron. In the neighbouring jungle, several large blocks of granite were visible peeping through the iron clay: in one place containing large specks of black mica, the stratification not real, since it was not continuous. The iron clay exactly resembles that of Midnapoor, containing brown red hematite and quartz. The granite resembles that of Cornwall with more mica, making it somewhat darker. The most remarkable plants are *Euphorbia antiquorum*, *Asclepias aphylla*, *Cassia auriculata*, *Gloriosa superba*. The extent of the iron clay formation, is well worthy of consideration, and I regret much that my mode of travelling does not allow me to pay more attention to its connexion with other rocks, as yet I have only seen it with granite, upon which it is directly laid.

The water of the tank at this Choultry, built of granite, is very pure and contains very little muriate of soda. I brought from thence marked No. 1, granite, iron clay, and red iron stone brought from the hill of Goondum or Mokush; my information was obtained from the Brahmin of Nyarpet.

Thursday, 19th November, 1818.—A short time after quitting the Chouvadi early in the morning, I observed clay slate coming out in the road, which was strewed for a considerable distance with large pieces of quartz and the iron clay. On examining the water of the tank, I detected sulphate of lime in considerable quantity as well as muriate of soda. I observed lumps of greenish blue clay slate in the village, said to come from the neighbouring hills; the commencement of the Venkatagherry range.

Friday, 20th November, 1818.—I observed granite coming to-day within a few yards of the Choultry, and in another place a large quantity

of flesh-colored felspar in blocks with stripes and lumps of quartz, also mica slate and granite, with a large quantity of green hornblende,* the decomposition of the hornblende leaves a greenish yellow clay very plastic; my time was so short that I was not able to search for the junction of the primary rocks with the iron clay. The heavy rain prevented me from opening the Palanqueen, so that I lost the termination of it. I saw it for the last time about 3 coss from Nyarpet.

Saturday, 21st November, 1818.—Just after quitting Goodoor, I observed large masses of granite cropping out, with a very large proportion of white felspar: during the day large pieces of quartz, sandstone, and iron clay were strewed along the road, but no rocks visible. In the neighbourhood of this village Venkatachellum, there are large masses and the tanks are built of the latter.

Sunday, 22nd November, 1818.—Nellore a long dirty town, built on, and partly of, the iron clay, which is here to be seen in an imperfect sort of stratification or rather seams which are neither parallel nor horizontal. I saw a well, 20 or 30 feet deep dug through the iron clay, which resembles very nearly those specimens presented to Mr. R. by Col. M. said to come from Mysore.

Monday, 23d November, 1818.—Paid a visit to Mr. Sutton at 12 o'clock, and went with him to see the quarries of iron clay. In one place over a stratum of it, the mould was upwards of fifteen feet in thickness and in others less.

* I observed pieces of brick and pottery, close to the surface of the clay in the vegetable mould. An antique figure of Buddha built into the masonry that forms the foundation of Mr. Lord's house near the quarries, has a very picturesque appearance. I also visited the iron clay in the banks of the Pennar, where it is seen on the right bank in great abundance: the bed of the river, which is very much choked up by alluvium, and therefore much higher than when the pagoda was built on its banks, is now effecting serious breaches in the wall surrounding it, as well as in a little temple of Chauvadi built on an elevated portion of the iron clay. The alluvium of the Pennar is entirely silicious, mixed with a few shells. I bathed, and found the water, where we crossed, brackish. The iron clay of this neighbourhood contains more cellular cavities and more brown hematite than I have hitherto

* Epidote ? undetermined.

seen. The neighbouring hills contain abundance of granite intermixed with hornblende, which I saw in a large piece near the tank.

Wednesday, 25th November, 1818.—We passed a tank built of the iron clay, which was however, entirely grass grown, as well as its banks, and surrounded by ancient granite statues of Siva, having a most romantic appearance, from its evidently great antiquity, and its remoteness from any habitation or temples. The soil and appearance of the country differs greatly from that on the other side of the Pennar, being very silicious. The Mango topes are in great abundance, and a greater extent of land is in cultivation.

Friday, 27th November, 1818.—Quitted Mawildroog for Ramahpatam, the sandy soil and shells betoken our near approach to the sea.

Saturday, 28th November, 1818.—On the hill is a temple in ruins, dedicated to the worship of Jagannath, built of iron clay and primitive greenstone; some images and inscriptions on the latter are very little defaced. A name of Vishnu, Balaram his brother, Shabudra his sister. The hill consists of iron clay and is about a mile in circumference, of an oblong form completely insulated. On the hill I found bits of mica slate, and primitive greenstone, with quartz rock and brown ironstone; but I was told they were all brought from a hill six coss distant. I cannot sufficiently regret my inability to observe the junction of the iron clay with the primitive rocks. The same magnetic ironstone is to be found here as at the red hills; I ascended the hill thrice during my twelve hours' stay.

Monday, 30th November, 1818.—The basis of the hill is granite with a considerable proportion of hornblende stratified; the strata dipping to the south at an angle of 90 and running east and west. On the summit the brown ironstone was pure, but lower down it was intermixed with quartz in considerable quantity. Thermometer 80°. Magnetic iron ore in considerable quantity; also veins of graphic granite: at the foot I picked up some primitive greenstone but saw none on the hill. I counted about 40 eminences of nearly a conical form in the large plain, about 20 miles in diameter. N. B. The ironstone appeared to be on the granite in an unconformable position. I observed the *Nepeta Amboinica*, seu *Indica* in great profusion on the summit of the mountain. At the top I saw the sea at a distance of eight miles. The whole country between this place and Ongole appeared to be an alluvial clay mixed

with small pieces of granite, greenstone, blue clay slate, and calc tuff mixed with clay.

Yellumpilly, Tuesday, 1st December, 1818.—The soil of the road and its neighbourhood was a rich black mould, tolerably stiff and retentive of moisture, and appeared to be the result of the decomposition of the primitive trap rock, of which the adjoining hills consist; we came to their feet or rather passed the end of the chain about eight miles from Yellumpilly. I ascended about 100 feet and found them to consist of vertical strata of trap, composed principally of hornblende in large crystals with a little felspar, with veins of hyaline quartz, and of granite containing garnets and very brilliant felspar; also large masses of a compound of what I shall call at present common schorl and grenatite, though in appearance very like. The vein of granite containing the garnets projected beyond the other strata, shewing less facility of decomposition. I saw also brown greenstone. Farther on in the road, we passed over granite and gneiss in vertical strata; the upper stratum consisting of calc tuff in a clayey loam. The variety of minerals, plants, insects, birds, &c. seen through this short march is truly astonishing and I unceasingly regretted my rapid passage through so many novelties.

Thursday, 3rd December, 1818.—I ascended a hill two miles from the Chauwadi, and found primitive greenstone in vertical strata, with veins of granite and brown ironstone: the direction S. E. The soil and cultivation as yesterday: about 10 it commenced raining and continued through the day, preventing me from making any examination of the interesting hills we passed. They appeared to consist of vertical greenstone, mostly conical, some small ones castellated and quite destitute of herbage, the former being but thinly covered. At one time I could count at least 40 of these conical hills, sometimes connected with each other by a low chain, at others quite isolated. In the plain at intervals we passed over the black mould, at others over beds of calc tuff and decomposing greenstone.

Friday, 4th December, 1818.—Our road to Repurlah lay through mountains of the same description as yesterday, greenstone slate in which were beds of quartz. On the road lay calc tuff with pieces of greenstone cemented in it. The calc tuff contains a considerable quantity of argil, and here and there small crystals of quartz. I was

not near enough to any of the hills to ascend, if I had time; when we had performed half our march the rice fields made their appearance, and the road was strewn with bits of a conglomerate very much resembling the iron clay, but consisting of carbonate of lime and ferruginous clay; now and then in the road and in the beds of nullahs highly inclined strata of gneiss and greenstone slate made their appearance. In a little temple built in honor of Hanooman, and in which there was his figure in basso-relievo, the portico was built of a beautiful sienitic granite, the hornblende nearly micaceous, being arranged in stripes with great regularity; my piety prevented me from robbing it of a bit for my cabinet. The face of the country now changed, and the numerous conical hills began gradually to disappear as we left them behind us, and at the end of the long plain before us appeared a chain of hills running N. E., as far as we could see; their shape angular and slightly peaked, altogether different in their general aspect from those we had quitted. I took the height of the Bar. exactly at 12, but discovered that the Calcutta workman had unfortunately neglected to solder the tube, which had shifted its place and totally altered the measure. Thermometer 82° .

Saturday, 5th December, 1818.—The heat and other occupations prevented me from going out until the evening, when I ascended the hill on which a small pagoda is built, due west from the Chauvadi, the steps, in number about 50, were formed of large slabs of clay slate; quartz rock was scattered about in very large masses; the pagoda was built principally of greenstone and schistose limestone, the rock surrounding it and on which it was built, was quartz rock coloured by iron, with veins of brown ironstone.

Sunday, 6th December, 1818.—In consequence of a halt, I rose this morning very early for the purpose of visiting once more the hill and pagoda. I found the whole to consist of quartz rock strongly impregnated with iron, except that in some places, it consisted of a white quartz in large blocks; that which was impregnated with iron had veins of brown ironstone running through it, principally in N. E. direction. The limestone and greenstone as well as clay slate come from hills about two coss nearly due west of the village.

Monday, 7th December, 1818.—The quartz rock continued for some miles from Nacricull, and we there saw a slaty limestone crossing

our path, which continued to appear from time to time until we were past Peddurgall. I afterwards saw large blocks of granite containing epidote; I could not however trace any connexion between the two rocks. The limestone appeared at times in vertical strata and at others nearly horizontal; it is not at all crystalline, and contains a considerable quantity of argil.

Tuesday, 8th December, 1818.—At Dachapilly, on our road to the Kistna, the horizontal limestone, or at least nearly so, made its appearance in great abundance; all the houses and walls of the gardens were built of it. In a pagoda I saw large blocks at least five feet by three. At this place it was to be seen of all colours from a very white semi-crystalline to a black colour. On our road after quitting Dachapilly, it alternated with the argillaceous calc tuff; about four miles from Dachapilly it was seen in great quantity of a dark black colour (compact Lucillite of Jameson), and on our approach to Pondegul it was covered by large and small rounded masses of quartz rock in considerable quantity. When on the bank of the Kistna, it was horizontal and of all colours, zoned, and with a substance intervening between the strata sometimes white and fibrous like tremolite, at others like red and black ironstone; sometimes containing small nodules of red ironstone, and in one instance, from a specimen I found in the bed of the river, green quartz.

Two furlongs above, and one below our present station, are found in the bed of the Kistna, large and small rounded pebbles of granular quartz rock, jasper with quartz and micaceous iron ore interspersed in it. The strata on the bank for at least fifty feet, have sunk in a very abrupt manner, I should suppose, from the gradual undermining of the river which is rapid and very full in the rainy season: it brings with it vast quantities of mud, which it deposits at the sides on the limestone, and thus marks its height. The river is about the breadth of the Thames at Battersea, and becomes suddenly very deep. The extent of this limestone formation, which is the compact limestone of Jameson, and although a secondary formation would form a very handsome polished marble, is very considerable; I first saw it at Nacricull, distant about thirty miles. It appears unfavourable to vegetation as in the jungle we saw nothing but two species of *Euphorbia*, and some hardy leguminous plants; I have as yet searched in vain for petrifications.

Wednesday, 9th December, 1818.—This morning I walked for some distance by the river side and on the bank above it; here I found the calc tuff in abundance containing rounded pieces of quartz, &c. exactly similar to those found on the river side. It is more than probable therefore, that these were once enveloped in the same substance, which being decomposed the stones contained in it were either carried down to the river or left on the surface of the limestone; the stratum of calc tuff must, however, have been of little thickness originally or more of it would have remained. I observed the same on this side of the river (Warripilly), which we crossed this morning in round boats of wicker covered externally with leather, and took possession of a large Caravan-scrail or Musjeed. We strolled after to the ruins of a large pagoda built of the limestone and with very large blocks, some of which were 10 feet in length; it appeared to be attached to a large palace or building surrounded formerly by an extensive wall: in the pagoda were images of Siva and a lingam: the only information we could obtain from a brahmin respecting it, was that it was built by a Hindu rájá many years ago, and was no longer used for worship, having been defiled. All round it were immense masses of the limestone completely denuded of all earthy covering. The walls were built of two solid pieces of stone placed on their edges, leaving a wide intervening space, so that on the outside they appeared 10 or 12 feet thick.

Thursday, 10th December, 1818.—Quitted Warripilly very early, so that I could not see the termination of the limestone. When we quitted Goonderpour where we breakfasted, I observed large blocks of granite strewed in every direction; this continued for a considerable distance, perhaps three or four miles, when irregular lumps of a primitive greenstone appeared among them; I perceived the calc tuff in small pieces, but could not ascertain if it existed in any quantity or whether brought there by accident: after a furlong the granite again; to-day large masses, in one place an isolated block 20 feet in height and 30 in circumference. At this place the Musjeed and part of the fort is built of it. It is of a white colour, a large proportion of felspar and little mica, quartz moderately abounding: I observed no hornblende in it.

Friday, 11th December, 1818.—I saw by moon-light some precipitous rocks of no great height and at a short distance from the road;

they had the rounded appearance of granitic blocks: at sunrise at a short distance from Teeperly, I saw the granite again, and found on my arrival the principal edifices partly built of it: it is highly crystalline and rather large grained. Strolling to the westward about five hundred yards from the town, I fell in with a large surface, not rising above ten feet from the ground, in an irregular manner, and extending about 100 by 50 feet wide, containing in it rounded and angular masses of a crystalline micaceous greenstone, which I presume the most superficial observer would consider as having been inclosed in the granite, when the latter was in a fluid state. I procured specimens of both granite and greenstone, but could not get at one which shewed their union.

Qy. How high has the iron clay been observed? At Cape G. H. very little above the level of the sea, and there covered by the sand flood; on the coast of Coromandel the highest I have seen about 100 feet; also what connexion with the calc tuff if they may not be traced passing one into the other?

Saturday, 12th December, 1818.—Immense blocks of granite all the way to Nelgondah, scattered without order throughout an extensive plain sometimes rising into hills of various sizes.

Nelgondah is situated between two very large and lofty hills consisting entirely of granite, sometimes white, reddish and black, containing veins of quartz of small size, and without any beds of other rocks as far as I could observe, my time being short; the plain reminded me of that in the neighbourhood of Ongole from the numerous unconnected hills and mountain masses.

Sunday, 13th December, 1818.—The granite rock which we ascended yesterday, and which we found so precipitous on its southern face, was continued in a lengthened declivity for a mile and a half, between Nelgondah and Mungoor. We saw rocks of granite scattered in every direction, and on the surface of those near the road, the calc tuff made its appearance, and from its decomposition gave the thin crust of soil on the surface a red colour; small pieces of greenstone were now and then seen, but no rocks.

Tuesday, 15th December, 1818.—I quitted Narrampet yesterday at three in the afternoon and passed through a beautiful vale between two lofty ridges of granitic hills: at their feet I saw greenstone in abundance.

I also saw a bed of a substance in specific gravity, hardness and fracture, much resembling corundum excepting colour which was green.

Monday, 21st December, 1818.—Facts in illustration of the history of iron clay formation, belonging according to Werner to the floetz trap.

1st. Its extensive diffusion,—Carnatic, Malabar Coast, Orissa, and Midnapore.

2d. Small elevation above the level of the sea.

3d. Connection in the Carnatic with primary rocks, Concan, Malabar.

4th. Its being apparently confined to the coast or extending only a short distance inland.

Saturday, 9th January, 1819.—I quitted the cantonment, Secundrabad, at three o'clock. I met Major Hopkinson at the bund of the tank, who was making or repairing the road destroyed by the overflow of last season; he was in the act of directing the removal of a large block of the greenstone; he told me that the vein was continued beyond the tank in a northerly direction, but that it could not be traced farther south; also that the large vein crossing the road to the residency, was continued in the same direction to Hyattnuggur 12 miles distant. He mentioned the singular discovery of cairns and druidical circles by W. P. of the Artillery; one of them had been opened lately of a curious formation and several bones had been found in it. The granite continues to wear exactly the same aspect here and on the road we have travelled from Secundrabad, the loggan stones and tors being very numerous.

Sunday, 10th January, 1819.—Halted the whole day at Chinchawalee ka Durga, and in the afternoon visited the tombs of Golconda; large cupolas supported on square pilasters of granite of an extraordinary length, some of them were at least 20 feet high, of solid stone. The tomb is in the centre of the hall, formed by the cupola and is made of greenstone. Of this stone we discovered a vein about 10 feet wide and running east by south, the same direction as those in Hyderabad: the sides were composed of granite intermixed with the greenstone which affected the form of rhomboidal blocks, and was penetrated by quartz veins. From the top of one of the tombs we had a very fine view of the fort of Golconda, which is

not so strong as it is supposed to be. Granite. No diamonds. The characteristics of this country and striking ones they are: loggan stones and tors of the most grotesque appearance, generally smaller than their support or pediment, and in many instances piled together by threes; their origin I shall hereafter speak of:—tanks of large dimensions varying from twenty to thirty miles in circumference, formed by dividing the bed of a natural lake formed during the rains, into two parts by a large mound or bund, through which several locks suffer the water to escape as it is wanted to fertilize the other half of the bed, converted into paddy fields:—the trap or greenstone running twenty miles E. by S. of which I have seen three miles; this stone is used for lingams and gods by the Hindus, and for tombs by the Mahomedans.

Monday, 11th January, 1819.—We travelled through a country similar in all respects to the one we had quitted, except that the granite tors assumed a still more grotesque appearance as we advanced, until within two miles of Puttuncheroo, when the granite suddenly ceased to be visible and a fine plain of alluvial soil was spread out before us covered with trees and bearing the strongest proofs of great capability for cultivation.

Tuesday, 12th January, 1819.—The country between Puttuncheroo and Begumpett, on which the village is built, consisted of the same fertile soil and plain, bounded on the east and west by low granite hills still preserving their peculiar features, when on our arrival at Begumpett the granite suddenly reappeared in our path and formed the hill on which it stands. On descending we found a stiff bluish clay which continued to the place of our encampment Susdanuggur, on the borders of a tank.

Wednesday, 13th January, 1819.—We travelled through the same plain; low granite hills making their appearance until we nearly reached Wondole, when quartz rock forming considerable elevations running in a N. and S. direction; this rock continued for a mile and a half, and then disappeared two or three hundred yards from Jogypett, the place of our encampment. There the rock rises highest, perhaps 50 feet. The quartz appears to have been once covered by an iron clay deposit from the quantity of pisiform iron ore found on it and from that formation being found in the ragines and rents at the sides and bottom of the hills.

Thursday, 14th January, 1819.—We passed through Jogypett, and crossed a plain about 7 miles in breadth, between the quartz rock and the hill on which Col. Hampton's flag was fixed; the sides were covered with angular and rounded masses of a rapidly decomposing greenstone or hornblende rock, on breaking which the grey colour of the decomposing surface was found extending into the black crystal-line rock for about 2 lines. The soil formed by its decomposition was very rich and retentive of moisture. The form of the surrounding elevations was nearly similar and had nearly the same N. and S. direction. The stone had no perceptible effect on the magnet.

Monday, 18th January, 1819.—We quitted Tadmanoo for Jogypett: I had a better opportunity of observing the scattered lumps and masses of granite, which are strewed without order on the plain at the foot of the quartz rock. I observed no difference in its structure from that of Hyderabad. On descending the hill I passed just before the sun rose, through a stratum of air in which the evaporation was rapidly going on, producing a very cold sensation; when I came to the bottom, as I had gone faster than to allow the inferior stratum to be affected by the same cause, the warmth was very agreeable, but as I could go no lower it speedily became cold as before, until the sun rose and counteracted the effect of the evaporation. I forgot to observe that the quartz rock is crystallized in rhombs, some of the angles of which are very perfect.

Tuesday, (Mungul) 19th January, 1819.—We crossed the quartz rock which is not above three hundred yards in breadth and on descending into the plain watered by the large tank of Jogypett, soon met with lumps and masses of granite, which gradually increased to the river Manjira, of which it formed the banks: on crossing the river, now about its medium height, we observed with surprise veins of white granite passing through the syenitic granite, which forms its banks. The rock containing these veins is much more susceptible of decomposition from the hornblende which it contains, than the veins of red and white granite, and the appearance produced, was like a fret work, when the broad surface of the rock was exposed; when an edge was left to the action of the atmosphere it was in small diagonal ridges.

This formation appeared confined to a space of a few hundred yards only on the right bank of the river.

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It is worthy of remark that this river after we crossed it at Begumpett, takes a considerable turn to the N. and that its bed no longer contains calcedonies there found in it. The mud however is the same, and appears to be that arising from the decomposition of the trap rock of Tadmanoor and elsewhere. After passing some elevated minor granitic hills, we pitched our tents on the borders of a lake at the foot of the station Suldapoorum.

Wednesday, 20th January, 1819.—The mixture of granite and syenitic granite extends to this place, as I observed masses of the syenitic granite imbedded in the former near my door, it reminds me of the same appearance at Teeperty, near Ncelgondah; as I have specimens, I shall have an opportunity of comparing them.

Thursday, 21st January, 1819.—About halfway up, the blocks of granite disappeared, and the path presented the decomposing trap rock of nearly the same nature with that of Tadmanoor hill, its decomposition forms the same rich soil as on that hill; I found amongst its specimens of a substance intermediate between heliotrope and hornstone. From the top I counted 33 lakes and should have counted more had the horizon been clear, the hill is not above two hundred feet in height, my barometer fell $\frac{2}{10}$ inch. The neighbouring mountains were slightly elevated above us and their direction and form nearly that of the one we were on, N. and S. and round backed, with two or three slightly conical and more elevated summits in the range; in one instance a range of low hills appeared to cross diagonally, indeed the direction of all was very indistinct and most commonly curvilinear.

Friday, 22nd January, 1819.—For several miles after quitting Suldapoorum, I passed through a beautiful forest of Teak, Mango, Ficus indica, Tamarind, and other fine trees and shrubs mostly leguminous; the soil was partly granite and partly decomposing greenstone, but wherever rocks were visible they were invariably granitic. At a small village situated on an immense divided mass of granite a trap vein (primitive greenstone) crossed my road, running east by south; another about two miles farther became visible, of larger dimensions and was lost in the jungle, in a short time we were surrounded by granitic rocks with the same features which distinguish those of Hyderabad; huge masses with a concentric lamellar structure, loggan stones, tors, &c., but with a large quantity of detritus at the feet.

In the alluvium at the foot of the pass to Chittial, was found a large breccia containing handsome specimens of amethyst quartz accompanied by quartz and cemented together by a silicious sand, strongly impregnated with iron.

Sunday, 24th January, 1819.—I gained the top of the hill after breakfast, and on my way found a considerable quantity of earthy-brown and red ironstone lying scattered in the ravines and in the spaces between the granite rocks, I had no means of judging whether it formerly belonged to any formation such as the iron clay, but it certainly resembled that found in it.

Monday, 25th January, 1819.—The ranges of hills appear to run principally N. and S: from to the east of north. As I descended I found a substance resembling calc tuff, in quartz, in a ravine, lying on the surface and apparently brought down by the rain from higher ground. I rode to Maidurh and round the hill on which the fort is seated: it resembled very much that of Golcondah: I passed a river running from west to east and some strange tors and loggan stones.

Tuesday, 26th January, 1819.—The road lay this day through a tolerably rich country, whose soil was of the black argillaceous kind arising from the decomposition of the transition trap: although on advancing, without apparently changing our level we met with the old granitic sandy soil, which is that of Ringumpett; and in its neighbourhood, where our tents are pitched, is a large grained granite with very handsome bluish grey felspar. I forgot to observe that the forms of the granitic rocks were more varied than I had yet seen them, forming every description of loggan stone and tors that can be conceived.

Wednesday, 27th January, 1819.—The soil alternated from the black cotton soil, as it is called, to the sandy granitic, and the only rocks we saw in this extensive plain were granitic in small lumps and masses. As we approached the river Manjira, they were profusely spread on its banks and in the middle of its stream; here and there in its bed we observed small pieces of calcedony and cornelian. About three miles from our station Ringumpett, I observed a very small-grained reddish granite, much used in the buildings of the village.

Our station was on the transition greenstone, differing in no respect from that of Tandmanor, the same black thirsty soil covered with the *Poa cynosuroides* (Kusa grass), also the *Semicarpus enacardium* and

Butea frondosa. At a lower part of the hill due east from the station, I observed in a stone different from any other I had previously seen, several turritulites and bivalves. The stone is of a bluish grey colour alternating from that to a blackish grey, containing transparent spots of stalactitic silica, its fracture is for the most conchoidal, even, with sharp edges; it is hard, easily frangible and specific gravity about 2.0. I have since found in another part of the hill nearly due north from the station, large nodules of corroded and vesicular flint, and masses of the former stone passing into flint; some of the masses were a foot and a half in diameter. I also in nearly the same direction from the station, at the distance of half a mile, saw the transition trap laid bare; it affected the columnar form and was every where split and divided without any appearance of stratification; in some cases I found on the surface concentric layers rapidly decomposing, enabling me to remove two of its coats.

Friday, 29th January, 1819.—I went this day to the southward and westward as I had previously been to the other quarters of the station. The cultivation has evidently extended all over the hill, fully accounting for the smallness of the shrubs and trees on it: ravines proceed in every direction from the top, forming in the rainy season large torrents, supplying the Manjira with the mud which it then deposits on its banks. In the lower grounds I saw wheat, cotton, ricinus, and linseed in cultivation and in flourishing crops. We had scarcely arrived at the bottom of the hill and about half a mile from the first village when the granite appeared in an abrupt part of the road: near its first appearance we found precisely the same mixture, which I have twice before noticed, viz. at the Manjira and Repurlah; near it was a bed of Meerschaum. The granite with its customary attendants in the shape of loggan stones and tors soon succeeded, with here and there masses of greenstone rolled and scattered without order. The jungle prevented me from tracing their origin. In the evening I visited the fort and saw at least a radius of 30 miles of the surrounding country: we were still in the vast plain, but now more broken in upon and diversified with rocks of granite. This is now redder and contains veins of a still redder granite. It has also less of the appearance of concentric layers and has a more stratified look. The fort is miserably dilapidated, we were admitted without the least cere-

mony. The country appears destitute of springs and depends entirely on the rainy season and a few rivers for its supply of water.

Sunday, 31st January, 1819.—In the evening I observed in the banks of a small nullah, dry in most parts and containing only a muddy water tasteless of any saline impregnation, an incrustation of carbonate of potash from and apparently by the decomposition of the felspar of the alluvial* granite of which its sides were composed, acidified by the atmosphere.

Monday, 1st February, 1819.—A short march from Sauhrampett to Bachapilly; the granite continues to be red and of a small grain; about half way a vein of greenstone passed the road. After breakfast I ascended the hill which has a fine prospect in a southerly view, bounded by a range of hills running east and west; their outline was rather different from those I have been amongst for some time past, being more peaked,—the Manjira taking a N. W. direction is in the plain between. The mountain or rather hill of Bachapilly is almost insulated and may be seen on all sides at several miles distance although not 200 feet in height. It consists almost entirely of granite in large irregular masses piled one on the other without order.

Tuesday, 2nd February, 1819.—I left Bachapilly this morning for the river Manjira, its nearest approach being about 4 miles E. S. E. of the hill. The road lay through jungle with heaps of granite at intervals in hillocks, and irregularly strewed over the ground; 2 miles from the encampment the road was crossed by a primitive greenstone vein taking its usual direction. On arriving at the river I found its banks and bed lined and filled with granite: on the right bank the black alluvium was thirty feet above the level and perfectly horizontal on the top: the bed consisted of granitic sand, a few pieces of calcedony not very frequent, and a few shells of the same species I had previously found on crossing it first.

I should have observed that I saw magnetic iron sand mixed with the mud on the bank of the river. Also in a stream which emptied itself into the river, a trace of the efflorescence of carbonate of potash. Our encampment is not above the level of the banks of the river, there being no difference in the barometer observed at each place.

Wednesday, 3rd February, 1819.—The hills have no regular course or direction, one of the proofs of which is that the river runs in the midst of them.

* So in original: *diluvial* is probably intended.—Ens.

Thursday, 4th February, 1819.—I saw also near the village of Bachapilly some singular veins of granite rising through a greenstone or syenitic greenstone, very similar to what I had before observed on the banks of the Manjira: the veins having resisted decomposition much better than the containing rock remained projecting two feet in some instances: it is remarkable that a shift of the veins had taken place: the granite vein was sometimes white and sometimes red like that at the Manjira, the course of what we could discern of this formation, which lay in a field formerly in cultivation and over which the jungle was spreading, was east by south. Visited the Bears rocks, a granitic elevation of thirty feet, distant east by south from the station about 400 yards. Its base consists of a large grain containing red felspar, white compact ditto, and hornblende, forming altogether a beautiful stone; through this mass, a vein of syenitic greenstone differing in width from three feet to a few inches, runs for about fifty feet; this is again crossed by veins of a finer granite nearly resembling that higher up, which is in large blocks apparently placed without order, but an eye accustomed to these rocky elevations, almost peculiar to this country, discerns in these masses the remains of a concentric coat of granite. The remains of strata filled with these granitic veins are very common between.

Friday, 5th February, 1819.—On our road through the plain the same kind of granite to which we had been so long accustomed was frequently seen in irregular masses, two miles from Bachapilly we crossed a small nullah running in the direction of the Manjira. Immediately before entering Polelum a large deposit of quartz rock running E. and W. about half a mile, resting on granite. It was of the same description as that at Joggypett: our road then lay through a plain of black cotton soil, when after a tedious journey through a thick jungle in which nothing was to be seen except masses of granite, and now and then lumps of greenstone; we began to ascend a hill composed of greenstone, having the same characteristics as that of Tandmanoor, containing foliated zeolite in abundance and calcedony lying loose in the ravines, and on its surface high kusa grass (*Poa cynosuroides*).

Sunday, 7th February, 1819.—I quitted the hill with Everest early to go to Kowlass, we descended one of the ravines so common on these hills and soon came to the usual kind of granite, but could not observe

the junction of the strata; we again began to ascend by a very long road, until the junction between the trap and granite was very distinct, and on looking around us each of the numerous elevations in sight appeared covered with the same kind of trap resting on granite. It is worthy of remark that many trees on the hill are destitute of leaves, whereas in the valleys and ravines they appear to preserve them late in the season. We now began to ascend the hill on which the fort of Kowlass stands, in which there is nothing externally different from that of Medenkalh Golcondah; the fort and basis of the hill are of granite both red large-grained, and grey small-grained; on its northern side and near the summit a very considerable vein of greenstone crosses the path running E. S. E. and W. N. W., its northern or upper edge is well defined and consists of greenstone porphyry, containing both crystals of felspar and smoky quartz in the upper part of the vein, but lower down the hill, the stone is a coarse greenstone very subject to decomposition which takes place in a concentric manner and very similar to that of the hill of Boorgapilly, which is more secondary and contains zeolites; its lower edge is less well defined and instead of being bounded by the granite as on the other side, it is spread for several yards over the granite, lying directly upon it: the breadth of the whole is from about 40 to 50 feet; its length we had it not in our power to ascertain. After my return I visited the village of Boorgapilly, the environs of which consist of a very rich soil formed by the decomposition of the trap; in which soil, where it has not been disturbed, the zeolite has been re-crystallized in silvery plates.

Wednesday, 10th February, 1819.—We crossed a nullah after descending the hill of Kowlass, running east to Manjira. We passed through a large plain of the black cotton soil and arrived at Beechcondah, through a pass of granitic rocks, in which were many loggan stones, and angles were taken. I reduced the temperature of Fahrenheit from 88 to 59, at $\frac{1}{2}$ past three o'clock, P. M. The hill or hills are composed of red syenitic granite very similar to that at Bachapilly, though of a smaller grain. I had an opportunity of observing the communication between this plain and the one which it follows. The whole is flooded during the rainy season, and affords an easy explanation of the universal appearance of the black cotton soil except in the neighbourhood of those hills which are covered by granite alone.

We passed several little rivers on their way eastward to join the Manjira. An explanation of the cause of the total absence of trap on some of the hills must still be sought for.

Thursday, 11th February, 1819.—Through the continuation of the plain to which Beechicondah is the pass. For some distance granitic sandy soil, when a river produced its usual accompaniment the black cotton soil of the trap. We passed Mudnoor at the back of which to the N. E. the granite commences surmounted by the trap. As we crossed the fields and ascended the hills of Bukutapoor, calcedony with green-earth, heliotrope, amygdaloid wacke, with zeolite, stilbite, and carbonate of lime coloured green, were found in great abundance and very fine specimens.

The western side of the hill on which we are encamped is composed of the crystalline transition greenstone, but in the vallies and towards the eastern side it consists of wacke enclosing large specimens of foliated zeolite or stilbite with amygdaloidal pieces of green-earth, which has given its colour to carbonate of lime also contained in it. The wacke is of a greenish grey colour and is destitute of crystals of olivine or of basaltic hornblende.

Friday, 12th February, 1819.—I visited a ravine about a mile due east of the hill, in which the trap was much water-worn. In one part it had very much the external appearance of the Rowley Rag Basalt described in Thomson's Annals, being semicolumnar. In another part, it consisted of nodular concentric masses of which the external coats were decomposed, leaving rings around a lump of more compact nature undecomposed, on others a number of concentric circles visible of various sizes, according to the quantity of the mass decomposed.

Our servants have brought in a number of very handsome specimens of

Wacke	contg. Foliated zeolite.
Ditto	Green earth.
Ditto	Green carbonate of lime.
Ditto	Nodular mesotype, heliotrope.
Ditto	with green-earth and calcedony.
Ditto	with Jasper ditto ditto.

Saturday, 13th February, 1819.—The surrounding hills and acclivities are of two descriptions. The lowest are of granite, are rugged,

consisting of masses heaped one on the other and of loggan stones. The lower are generally east and west, level at their tops, with now and then rounded summits terminating by rather an abrupt slope, and containing vallies having the appearance of the embrasures of a fortification; I recollect seeing the above hills mentioned by Colonel Mackenzie in his journal. The basis of all these hills is granite, reddish and of a small grain.

Sunday, 14th February, 1819.—List of minerals found on the hill and in the neighbourhood of Bhutkahpoor, during a residence of four days there :—

Basis of the hill, granite of a reddish grey colour and small grain.
Granite.

Greenstone, early contg.	Zeolite.
Wacke concentric.	foliated.
.. globular.	radiated.
.. amorphous.	Heliotrope.
.. cellular.	Carbonate of lime.
Amygdaloid, contg.	Green earth.
Zeolite.	Calcedony.
Carbonate of lime.	Quartz.
Green earth.	Cacholong.
Brown ditto.	Striped agate.
Calcedony.	

Thursday, 18th February, 1819.—We quitted Bhutkahpoor, at 4 o'clock this morning. I had employed the three preceding days in visiting various parts of the neighbourhood. I found three streams of water descending from the hill in different directions supplied by infiltration: the temperature of one was 10 degrees lower than that of the atmosphere which was 88°. The wacke was not very general and appeared only in beds of small extent, the general rock being an earthy greenstone with no crystals of any description. I found in all the sides of the streams the efflorescence of the carbonated alkali, and I am at a loss to determine, whether it proceeds from the soda of the zeolite or the potash of the green earth. A dense precipitate was occasioned in water from a spring in the neighbourhood of the camp by alum in powder. I arrived at Daigloor, a short time before sunrise; about a mile distant I crossed a river, the bed of which was composed

of large blocks of red crystalline granite contained in a breccia composed of limestone cementing quartz and red felspar; the sand of the bed was similar to that of most other rivers that I have seen, taking their rise from the trap hills and flowing through granite country; consisting of the debris of those two rocks as well as calcedonies and land shells of three sorts, buccinum, helix and pusilla, the right bank of the river resembled exactly that at Ramaleddypett, being lofty and composed of the black cotton soil. I passed over other ranges of the trap, of low height, until our descent into the plain through which the Mubnar passes, the right bank of which is also very steep.

At Adainaor the granite for more than one-half the height of the hill, and covered at the top by a very compact greenstone with crystals of felspar, and a few cavities not filled with any substance. The course of these trap hills was very distinctly seen from this point due E. and W.

Notes on the Zinc Mines of Jáwar, by Captain J. C. BROOKE, Mewar Bheel Corps.

I have forwarded to your address by dawk banghy a box containing specimens of ore, and of the metal extracted therefrom, found between Kherwára and Udypura, and shall feel much obliged by your procuring me an analysis of the same, and information as to the composition of the metal* and the best method of smelting the ore. As a description of the place where it is found may prove interesting, I send you a few notes concerning it, and the little information I have been able to obtain of the former methods of working the mines.

2nd. The hilly country of Mewar has always been known to abound in metalliferous ores, and it is supposed that the produce resulting therefrom was one of the sources of wealth, by which former Ránús of Udypura, were enabled to contend successfully for so many years against the might and power of the Delhi emperors. The most celebrated of these mines and which were worked to the greatest advantage

* Zinc: the specimens sent are very small, and apparently contain very little metal.—EDS.

are undoubtedly those of Jáwar. They are incidentally mentioned by Captain Tod in his *Rajasthan*, and are stated to have yielded a net revenue of Rs. 220,000 a year. They became closed during the great famine, which devastated western India in A. D. 1812-13, during which the miners, dependant on the surrounding country for food, were obliged to leave a locality situated in the heart of the Bheel country, whose starving population seized all the grain intended for the city of Jáwar. The government of Udyapura, too weak to defend itself, and at the time oppressed by the Mahrattas and other freebooters, failed to forward the requisite assistance, and the town suffered the same fate as that of many other places.

3rd. Jáwar lies half way between Kherwára and Udyapura, or some 25 miles due south of the latter place. It is situated in an irregular valley surrounded by hills rising to a height of 1000 to 1500 feet, clothed with rich verdure to their summits, and overlooking an irregular-shaped plain covered over for a space of 5 or 6 square miles, with the monuments of former wealth and importance. Many of these ruins consist of ancient buildings and temples on hills rising in several instances to the height of upwards of a hundred feet, and composed entirely of ashes, which alone fully attest the distant period from which the mines must have been worked. The small river Thirí flows through the plain. It has been in one place bunded up with a masonry bund now in ruins, the excellence of which is attested by the age of the temples built hundreds of years ago on the alluvium of the lake that must have formerly formed an extensive and lovely sheet of water. The chief hill which was used for mining has been worked into a mass of excavations, from which myriads of bats and a stray bear now and then serve to startle the incautious intruders.

4th. It is some 6 years since I first visited Jáwar, and it then occurred to me to induce work-people to re-open the mines, but I was unable to procure specimens of the ores from the jealousy of the then Minister of Udyapura, as to my intentions in bringing these hidden treasures to light. On a subsequent occasion about 2 years ago, I proposed to the present Máhá Ráná of Udyapura, the expediency of opening the mines; he appeared very anxious to do so, and authorized me to obtain miners from Ajmere. Having addressed Licut.-Col. Dixon on the subject, that officer with great kindness entered fully into my

views and pointed out to me the little use of commencing mining operations at all, unless perfectly sure of the value and richness of the ores to be worked. He mentioned the various descriptions of ore which were most likely to be found, and gave me several useful hints on the subject.

5th. Seeing it was waste of time to do any thing before having procured specimens of the ore, I allowed the matter to rest, till on a recent visit to Udyapura, I again mentioned my wish to His Highness the Máhá Ráná, who ordered me to be supplied with whatever was needed, and issued the like orders to an old man, the only remaining inhabitant of old Jáwar, during the time of its prosperity. The Ráná gave me to understand, that the previous year he had directed the old man to smelt a little of the ore which he had done, and brought to Udyapura, but afraid of losing his influence, should he divulge the secret of preparing the ore for the furnace, he had refused to give information as to the manner of working it,—the Ráná thereon tried to burn a little himself, but all his crucibles broke.

6th. A few days afterwards on my visiting Jáwar, the old man came and at my request brought a basket of the ore in its rough state. He described it as being found in veins 3 or 4 inches thick and sometimes in bunches, in quartz rock and mixed with other stone. He broke some pieces with a hammer, showing me the good ore and the simple way it was freed from the quartz rock, with which it was mixed (specimens of good ore, inferior ore, and ore mixed with quartz, are sent). The pure ore being very friable is then pounded and freed from quartz and placed in crucibles some 8 or 9 inches high and 3 inches diameter; with necks 6 inches long and half an inch in diameter. The mouth being fastened up, the crucibles are inverted and placed in rows on a charcoal furnace when the ore is fused in about 3 or 4 hours. If pieces of the quartz are allowed to remain with the ore, the crucibles of course break, and hence, the old man informed me, the Ráná's failure. From each crucible the quantity of metal collected does not vary much, a specimen of that extracted for the Ráná from one crucible is sent, as are also remains of ancient crucibles found among the ruins.

7th. I could not discover whether any flux was used in the smelting, or whether the crucibles are entirely or only partially filled previous to the operation.

8th. The above is the description of the process given by the old man. I have only to add, that not pretending to be a geologist, I will not hamper with crude suppositions the opinions of those to whom the Society may make over the specimens for analysis. I am fully satisfied with having brought the mines to light, and I have only to request that, as I see no daily paper, you would oblige me by favouring me with a copy of whatever information may be elicited on the subject of the metal or the ore. It is very probable that with the immense import of all kinds of metals from England, the working of these ancient mines may not now be profitable, still the subject is itself interesting, as bringing to notice another part of India in which mineral riches abound.

Description of a new species of Mole (Talpa leucura, Blyth).

• • •
By ED. BLYTH, Esq.

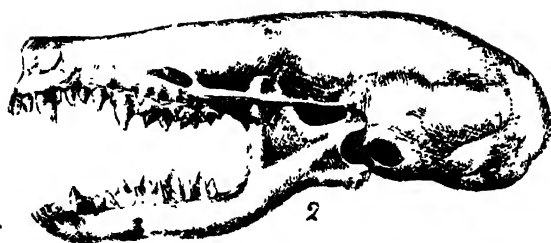
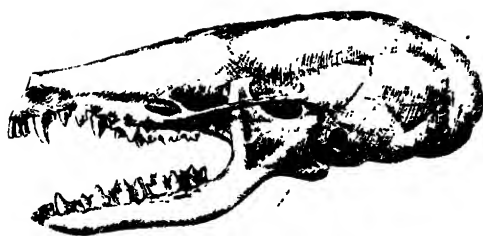
The species of restricted *Talpa* that have hitherto been described amount to four only in number, that I am aware of; viz. *T. europæa*, L., of Europe generally,—*T. caeca*, Savi, of Italy and Greece,—*T. moogura*, Temminck, of Japan,—and *T. microura*, Hodgson, of Nepal, Sikim, Butan, and the mountains of Asám: but the Society's Museum has long possessed specimens of another from Cherra Punji, (N. of Sylhet), which I have recognised as distinct for some years, but now only proceed to describe.

In its external characters, the Cherra Punji Mole differs little from *T. microura*, except that the tail is considerably more developed, though much less so than in *T. europæa*; and the latter is clad and tufted with white hairs, whence I propose for the species the name of *T. leucura*. This animal, also, would seem hardly to attain the size of *T. microura*. An adult female in spirit measures $4\frac{1}{4}$ inch. long, with tail $\frac{3}{4}$ inch additional: the latter is of a club shape, much constricted for the basal half, as represented in one of the accompanying drawings. The general colour of the fur, too, is less fulvescent than is usual with *T. microura*. In both of these Asiatic species, as in *T. caeca*, there is no perforation of the integument over the eye, as in *T. europæa*; the skin being there merely attenuated and imperfectly transparent.

But the characteristic distinction of *T. leucura* consists in having only two small præmolars in the upper jaw anterior to the great last præmolar (*carnassiez*, or 'scissor-tooth'); both *T. europæa* and *T. microura* having three,—these being comparatively larger and less separated in the latter, and the *carnassiez* is also much larger in *T. microura* than in *T. europæa*. The posterior spur of the canine (? or *pseudo-canine**) is remarkably developed in *T. leucura*, in place of the absent small præmolar. In the dentition of the lower jaw, there are also characteristic differences distinguishing these three species. In the Moles, as in most other *Insectivora*, and also in the *Lemuridæ* (the very peculiar genus *Cheiomys*, which has rodential tusks, excepted), the lower canine is minute and takes the form of an incisor, for which it has been very commonly mistaken;† and the first præmolar is developed to assume the form of a canine, but locks *posteriorly* to the upper canine (or *pseudo-canine*, and like it has a double fang). There is no instance of a genuine lower canine locking behind the upper one, unless the gnawing tusks of the *Rodentia* and of the Lemuridous *Cheiomys* be regarded as the homologues of canines; which seems to be indicated more by the co-presence of undoubted upper incisors in the *Leporida*, than the reverse is by the difficulty of always tracing the origin of upper rodential tusks through the intermaxillaries to the true maxillary bones in the rodents generally. But to return to *Talpa leucura*: following the minute lower canine and the canine-like first lower præmolar of this species, there are two small præmolars anterior to the *carnassiez* or last of the series, and the first of these is conspicuously much smaller than the second; in *T. microura* the two are of equal or nearly equal size, and occupy more space longitudinally; while in *T. europæa* these and the *carnassiez* successively enlarge in a regular gradation, the latter being proportionally smaller

* In all the *Insectivora*, Cuv., which apparently possess upper canines, these teeth have rather the structure of *modified false molars*, and, I believe, have always double fangs, as exemplified by *Talpa*, *Centetes*, and *Gymnura*. I figure the upper *pseudo-canine* of *Talpa europæa* extracted from its socket, by way of illustration.

† No placental mammal has more than three pairs of true incisors, or than three pairs of true molars (distinguished by their not being preceded by deciduary teeth in the young animal, as is the case with all other teeth). Although certain instances occur, as especially in the hoofed ruminants, where the lower canine is hardly (if at all) to be distinguished from the incisors, yet this fourth supposed pair of incisors never co-exists with an undoubted canine (vide the Camels, Horses, Tapirs, &c.), that is among the *placental mammalia*, inasmuch as they are the veritable homologues of those teeth.



than in the two Indian species. Both scissor-teeth are indeed most developed in *T. microura*, and the teeth generally are more robust.

The specimens of *T. microura* from Asám, like those of Nepal, have generally a very minute tail, which can at least be distinctly enough felt under the fur; but those from the vicinity of Darjiling have no external trace of tail, whether sent as skins or in spirit. I have found, however, no perceptible difference in the skulls and dentition, nor in any other character whatever, that should warrant us in considering the tail-less Darjiling Moles as a distinct species, separable from *T. microura*. The Society's museum contains *T. leucura* stuffed and in spirit, and the skull of the specimen preserved in spirit has been extracted and cleaned; while the dentition of the stuffed specimen is exposed, and is quite similar to that of the other here described. It is not improbable that *T. leucura* may extend its range eastward into China; and in that direction we may look for additional species of *Talpa*, if not also in western Asia. In Africa the genus is unknown, but is represented in the south by *Chrysochlore*; in N. America by *Scalops* and *Condylura*; while in S. America the *Insectivora*, Cuv., do not occur, their functions being performed by numerous diminutive species of *Didelphys*, as also may be said in Australia by the *Perameles* tribe; and it is far from unlikely that Australia may yet be found to produce a fossorial marsupial form, resembling the Moles as other *Marsupialia* present an analogical but superficial likeness to certain other *Insectivora*.

Explanation of plate. Skulls of the genus *Talpa*, magnified to twice the natural size.—1, *T. leucura*—2, *T. microura*.—3, *T. europæa*.—1, *a*. Tail of *T. leucura*, nat. size.—3, *a*. Upper pseudo-canine of *T. europæa*, magnified.

Note on the Formations and Lead Mines of Kohel et Teráféh, Eastern desert of Egypt, by ILEKEKYAN BEY. Communicated by Captain T. J. NEWBOLD, F. R. S., Foreign Member of the Philomathique and Geological Societies of France.

NOTE.—The old Lead Mines of *Kohel* lie near the Red Sea, a day's journey N. by E. from *Gebel Zubára*, in about Lat. 24° 40'. Not far distant are the Lead Mines of *Gebel Rassás*, (i.e. mountain of lead.)

The use of lead was known at an early epoch in the history of Metallurgy. Mention of it is made by Moses in his song of triumph

and thanksgiving, after the passage of the Red Sea and the overthrow of Pharoah and the Egyptian host in its waters. ["Thou didst blow with thy wind, the sea covered them : they sank as lead in the mighty waters." Ex. xv. 10.] Again in Numbers xxxi. 22,—where it is mentioned with the other five metals most in use at this early period : ("only the gold, and the silver, the brass, the iron, the tin, and the lead.") Job thus alludes to the use of lead for the permanent record of remarkable transactions, (xix. 23, 24.) "Oh, that my words were now written ! Oh, that they were printed (written ?) in a book ! that they were graven with an iron pen and lead in the rock for ever !" Again in Jeremiah vi. 29. "The bellows are burned, the lead is consumed of the fire, the founder melteth in vain." According to the following passage in Ezekiel, by whom this metal is mentioned more than once, it would seem to have been imported into Palestine by merchants from Tarshish (xxvii. 12.) "Tarshish was thy merchant by reason of the multitude of all kind of riches ; with silver, iron, tin, and lead, they traded in thy fairs." In the time of Zechariah lead appears to have been used for the sealing up and covering of vessels. (v. 8.) "And he cast it into the midst of the ephah ; and he cast the weight of lead upon the mouth thereof."

Pausanias speaks of certain books of Hesiod, written upon sheets of lead, and Pliny states, that public acts were registered on leaves of the same metal. A great number of leaden coins, most of them Greek or Roman, but some representing Egyptian divinities, have been figured by Ficorini in his *Piombi Antichi* ; and frequent allusion is made to leaden coins by the poets.

The ancient Egyptians made use of lead chiefly in their alloys, and for solder.

An ancient *Sistrum* found by Mr. Burton at Thebes is soldered with lead : and I have seen portions of this metal still adhering to cavities in hewn stones in some of the temple walls at Thebes.

The lead appeared to have been used for fastening bars of bronze or iron into the blocks. The bars have disappeared, but have left their traces in a few places, in stains of rust or verdigris. According to Diodorus lead was employed by the Egyptians in purifying the gold dust, found on the confines of Egypt, which he tells us (iii. 11.) was placed with a fixed proportion of lead, salt, a little tin, and barley bran into earthen crucibles closed with clay, and exposed to heat in a fur-

nace, for five successive days and nights. Lead (galena) is not only found at the old excavations of *Kohel et Teráfek*, but in several other places in the eastern desert of Egypt, generally in short veins and nests, in the limestone, as at Wadi Araba, and the Mokattern. Old lead mines are said to exist at *Gebel Rassás*, as before observed.

T. J. N.

Formation around Kohel et Teráfek.

NOTE.—The beds in this section are taken in the ascending order commencing with the lowest.

T. J. N.

The formation in the plain (*fersh*) towards the N. W. of the *Kohel* is composed of parallel layers of coarse, yellow, compact psammite, a foot in thickness—succeeded by a layer, 4 or 5 inches thick, containing rolled pebbles of quartz, porphyry, granite, gneiss, &c. Seams of crystallised sulphate of lime intercalate these layers; and thin laminæ of the same matter branch through them vertically. Over them we have several beds of yellow psammite tinged with red, and containing nodules of oxidulated iron; each bed averaging from $1\frac{1}{2}$ feet to 2 feet, in thickness. Several thin layers of gypsum, with intervening clays and ferruginous psammites—about four inches thick in the aggregate, and a layer, about eight inches thick, of calcareous sandstone—very compact and hard—containing silicified bivalves in good preservation, succeed.

Overlying them is a series of light green and streaked psammites of a less compact structure than the inferior beds—each layer is separated from the other by an intervening seam of gypsum—about one, or one and a half inch thick.

Over these chloritic psammites we have a close arrangement of parallel bands of gypsum, with intervening layers of disintegrated clay (?) about twelve inches thick. Above them lies stratified sulphate of lime of a compact nature from twenty to twenty-five feet thick, with about seven or eight feet of a less compact sulphate of lime overlying it. Above the sulphates of lime we have a layer of corals: and over the corals a diluvium composed of a dark yellowish marl; on which reposes a gravel of sharp angular fragments of granitic and felspathic formations; some of the fragments are a cubic foot in size;

and a few of the larger blocks are slightly rounded. This diluvium covers the surface of this part of the *Kohel*.*

The strata of the *Kohel* hill here have a very slight easterly dip. The surface of the ravines passing through it, are inclined in a similar direction, but at a greater angle.

Lead Mines of Kohel et Teráfek.

The mines are situated about $1\frac{1}{2}$ mile from the W. shore of the Red Sea, as before observed. The ore, galena and carbonate of lead, occurs in an argillo-siliceous schist, associated with small quantities of sulphur and iron—a poor carbonate. The Bey visited seven excavations, which are mostly from three to four feet broad, about five feet high, and run down in inclined planes cut in steps. Galena was found in the shaft worked by Brochi; but the indications discovered are not considered favourable. Besides other minerals, titanated iron, manganese, zinc and fire-clay have been discovered here. The surface of the rock between the mines and the shore is coral limestone, covered with a gravel of granitic, gneiss, porphyry pebbles.

The mines were worked by the ancients: and the ruins of an old, but not extensive station still exist, in detached buildings of loose stones and foundations—some round,—others square. Water is brought from *Gebel Egleh*, or *Edjleh*—four or five hours' distance, but is bad, brackish, and causes vomiting.

The *fersh* of the *Kohel* produces a good deal of *Siyál wood*, (*Acacia Siyáleh*.)

From the mines the Bey took a S. W. direction by *Wádis Egli* and *Sakkari Siyáleh*, and after a day's march arrived at *Wádis Allem* and *Zubára*. In *Wádi Túmtúbah* are Hieroglyphs and a Zodiac, sculptured on some porphyro-felspathic rocks associated with gneiss, schists, and quartz, containing much argillaceous matter. At *Zubára* the principal rock is a ferruginous mica schist with quartz veins, containing bits of emerald. Grey granite, with silvery mica, micaceous amphibole, black steatite, and nodules of iron, occurs, also gneiss.

* The site of the granites, porphyries and felspars composing the "diluvium," is not far off, as the Bey has a note of having passed some felspathic and granite hills with quartz, invaded by porphyry and serpentine, the day before he reached the *Kohel*. These plutonic rocks lie westerly from the *Kohel*, and continue two days' journey in a N. W. direction, forming the *Kabarais* hills. The *Tella-t-el Kabarais* has a reservoir containing twelve months water. At *Wádi el Assel*, N. E. from *Kosseir*, and *Wádi Hinduseh*, they become intermingled with the sedimentary rocks, limestone and sandstone. At *Wádi Zúg el Bahar* two chains of marly limestone, chalk and psammites occur, overtopped by higher, and isolated clusters of felspathic rocks.

Remarks on the modes of variation of nearly affined species or races of Birds, chiefly inhabitants of India.—By E. BLYTH.

The drawing up of a catalogue of species of any class of animals involves a series of decisions as to what are to be considered species or merely varieties of the same species, in all of which decisions no two zoologists will be found to agree, inasmuch as in numerous cases of difficulty such decisions become quite arbitrary. The fact is, we find every variety of gradation from a similitude which does not permit of a distinction being made, to an amount of discrepancy which all would agree in regarding as of specific import. As species are often represented (I do not use this word in reference to a *system* of representation, in which I do not believe,) in distant countries by others bearing a greater or less resemblance to them, in some cases so close as scarcely to permit of discrimination, so there may be others having equal claim to be regarded as of distinct origin, even though utterly undistinguishable apart. Or a particular age or sex only may present some marked diversity, as instanced by the caterpillars of certain lepidopterous insects which are hardly, if at all, to be separately recognised in the *imago* phase of their existence. Mr. Swainson collected in Brazil specimens of a butterfly, *Papilio* (*Podalirius*) *nomius*, figured in his 'Zoological Illustrations,' which would hardly be supposed to inhabit likewise Lower Bengal; yet a species which, so far as can be judged from his very careful representation, is absolutely similar, abounds in the vicinity of Calcutta and other parts of Bengal during the dry hot season. It is true that we also get here the *Cynthia cardui*, which is a butterfly of almost universal distribution, alike in the British islands, America, and Australia:* but it does not appear that *Papilio nomius* has been observed elsewhere than in India and Brazil, and we can hardly suppose its race to have been conveyed from one of these countries to the other, or to have reached them both from a common point of divergence.

* We have compared specimens from Calcutta, Central India, the E. and W. Himalaya, and Afghanistan, with others from Europe and W. Australia, and could detect no distinctive character whatever.

Races deviate from the similarity which obtains among different individuals of the same race, in every way in which a difference could well be exhibited. Thus some differ only in size, as the greater and less European Bullfinches (of which the former is, we believe, the true *Loxia pyrrhula*, L.)—the *Turtur orientalis* and *T. auritus*,—the *Charadrius pluvialis* and *Ch. virginicus*,—the *Larus glaucus* and *L. islandicus*,—the Asiatic *Nettapus coromandelianus* and the Australian *N. bicolor*, Lesson,—*Buceros affinis* of the Deyra Doon and *B. albirostris*,—*Alcedo ispida* and *A. bengalensis*,—*Caprimulgus ruficollis* and *C. asiaticus*,—*C. monticolus* and *C. affinis*,—*Enicurus frontalis*, nobis, of the Malayan Peninsula and *E. speciosus* (Horsfield), of Java, —*Sylvia Jerdoni*, nobis, and *S. curruca*, (Gm.) both Indian birds,—*Cuculus canorus*, *C. himalayanus*, and *C. poliocephalus*, which are alike inhabitants of the Himalaya, &c. &c.

Or, with exact similarity of size and proportions, they may differ more or less in colour,—as the different species of Asiatic *Treron* with yellow feet, *e. g.* *Tr. phœnicoptera* of Bengal and Upper India, *Tr. chlorigaster* of S. India and Ceylon, and *Tr. viridifrons* of Burma; or the long-tailed *Tr. apicauda* of the S. E. Himalaya and *Tr. oxyura* of the Malay countries:—also the species or races of black-headed *Munia*, as *M. sinensis* of the Malayan peninsula, *M. rubroniger* of Bengal, Nepal, Asám, Arakan, and Tenasserim, and *M. malacca* of S. India and Ceylon. Such differences may be very slight indeed and yet constant, as in the foregoing instances and many more:—such as *Carpophaga ænea* of the Nicobar Islands as compared with specimens from the neighbouring countries,—*Palumbus Elphinstonei* of the Nilgiris and of Ceylon—*Oriolus melanocephalus* of Malabar and Ceylon and that of Bengal, Nepal, and the countries eastward,—*Pomatorhinus erythrogenys* of the N. W. and of the S. E. Himalaya,—*Caccabis chukar* and *C. græca*, auctorum,—the *Cyaneculæ*, the *Geocichlæ*, &c.; among which may be further enumerated the common Sparrows of India and of Europe, and the *Accentor alpinus* of the mountains of Europe and *A. nipalensis* of the Himalaya. The *Garrulus glandarius*, *G. melanocephalus*, and the Japanese Jay,—the *Sitta europæa*, *S. cæsia*, and *S. himalayensis*,—and the bare-necked white Ibises (*Threskiornis*) of India, Africa, and Australia, afford other characteristic examples.

In several such cases where the sexes differ, the adult males only of two or more races can be distinguished, as exemplified by *Thamnobia cambaiensis* of N. and Middle India and *Th. fulcata* of S. India and Ceylon,—also by some of the Indian long-tailed *Nectariniæ*,—by *Tephrodornis pelvica* and *T. sylvicola*,—by certain of the *Kallij* Pheasants (*Gallophasis*), and of the Tree Partridges (*Arboricola*). Or only the older males may assume a distinguishing mark, as in *Lanius superciliosus* of the Malay countries as compared with its representative in India. Or perhaps the old of both sexes may alone be distinguishable, as instanced by the amethystine *Chrysococcyx xanthorhynchos* of the Malay countries and its emerald-green Indian representative. Lastly, the nuptial plumage may alone present a constant diversity, which is very great in *Motacilla alboloides* and *M. dukhunensis*; and we should infer that *Hydrochelidon leucopareia* so common in India, and *H. fluviatilis*, Gould, of Australia, were not to be known apart in their non-breeding livery.

That we should not be too hasty in setting down these slight and apparently trivial differences as denoting varieties only of the same particular species, is indicated by the fact that with a constant variation of colour, however seemingly unimportant, is sometimes, if not commonly, associated a marked difference in the voice. This is very decided in the case of *Pratincola indica*, nobis, as compared with that of the European *Pr. rubicola*; the wild *Turtur risorius*, (L.) of India has also a very different voice (or *coo*) from the domesticated Dove so common in cages and called by the same name: and we should expect that the three Cuckoos before referred to will prove to differ remarkably in voice; while (so far as we can learn) the *Dendronanthus agilis* of India never emits the fine musical notes of the very closely affined *D. trivialis*. How excellent a criterion is furnished, in some cases at least, by the voice is illustrated by the multifarious breeds of the common domestic fowl, all of which speak the same language, which is a very different one, in every note uttered, from that either of the wild *Gallus Sonneratii* of S. India, or *G. Stanleyi* of Ceylon. But a more conclusive proof, that exceedingly close external resemblance may subsist when the species are unquestionably diverse, is deducible from the fact of the very extraordinary conformation of

the trachea in the female alone of *Rhynchea australis*, which peculiarity does not occur in either sex of *Rh. bengalensis*.

Following up this enumeration of the variety of modes of differing among closely affined races of birds, it may next be remarked that a great difference of voice and of habits may be only indicated in the structure by minute variations in the form of particular feathers; e. g. *Corvus corone* and *C. americanus*:—*Pernis cristata* is only distinguished from *P. apivora* by an occipital tuft of lengthened feathers more or less developed, in addition to its different habitat; and in *Spizaetus limnaetus* and *Sp. cristatellus*, the last named has a similar occipital crest generally much more developed, this being again the chief distinction besides that of geographical distribution, and that the former race assumes an ultimate phase of plumage which is never (so far as we can learn) seen in the other. The very different form of the crest and adjacent plumage is again the only distinction we are acquainted with between the larger Indian Pelican (*Pelicanus javanicus*) and the closely affined African species (*P. onocrotalus*). In many other instances the distinction is best shewn in the varying relative proportions of the wing-primaries, or even in that of a single primary, as exemplified by *Acrocephalus arundinaceus*, (L., vel *Sylvia turdoides*, Tem.,) of Europe, and *Acr. brunnescens*, (Jerdon,) of India.* *Pycnogotus jocosus* of Burma and Penang has always a shorter and more intensely crimson ear-tuft than *P. jocosus* of India, and we have been assured that the voices also differ. The *Irena puella* of India, and also of Arakan and the Tenasserim provinces, differs constantly from that of the Malay countries by having shorter tail-coverts.

Then we have cases in which sundry of the foregoing differences are variously combined. In *Loxia himalayensis*, *L. curvirostra*, and *L. pytiopsittacus*, the size is successively larger, with a successively more robust conformation. So likewise in *Gracula javanensis* and *Gr. intermedia*. The restricted *Edolii* differ slightly in size only, except that the larger have successively the frontal crest proportionally more developed. In *Cannabis linaria* (*Fringilla linaria*, L., v. *Linaria canescens*, Gould), as compared with *C. minor*, a difference of size is combined with a very slight one of plumage, and the song-notes are here again distinguishable. In *Pratincola atrata*, nobis, of the high-

* Vide *J. A. S.* XV., 288.

lands of Ceylon, as compared with *Pr. caprata*, a larger size is combined with a proportionally larger bill. The same is more strongly shewn in *Garrulax pectoralis* as compared with *G. moniliger*, and in *Hiaticula Geoffroyi* as compared with *H. Leschenaultii*; the plumage, and the seasonal changes of plumage of the two last named species, being absolutely alike. *Emberiza palustris* would resemble *Emb. schæniculus*, only that the beak is altogether of a different shape. So with *Montifringilla nivalis* and *Plectrophanes nivalis*, all the difference is in the bill (so far as we can remember). *Treron curvirostris* and *Tr. malabaricus* are alike in size and plumage, but their bills are of a very different form, and there is a bare space surrounding the eye, of the one and not of the other. *Pomatorhinus schisticeps* resembles in plumage *P. leucogaster*, but has a larger bill and much more developed and straighter claws. *Calornis affinis*, nobis (*Turdus columbinus*? Gmelin), has merely a larger size and generally duller plumage than *C. cantor*. It is easy to multiply examples, grading from absolute similarity to the exhibition of every amount and variety of dissimilarity.

In some instances where slight differences of colour only, especially of shade of hue, constitute the sole diversity, we have the presumptive evidence afforded by a series of many analogous cases, subject to the same conditions of climate, &c., manifesting the same phenomenon, which is therefore to be ascribed with the greater probability to the operation of a cause inducing the particular variation. Thus several Indian birds are much darker and more intensely coloured in Ceylon; —e. g. *Corvus splendens*, *Acridotheres tristis*, and the female of *Copsychus saularis*: *Dicrurus leucopygialis* of Ceylon thus differs from *D. caerulescens* of India in having only the vent and lower tail-coverts white.* *Pomatorhinus melanurus* of Ceylon has the colours more fully brought out, as compared with *P. Horsfieldi* of peninsular India. *Palumbus Elphinstonei* of Ceylon wants the ruddy margins of the dorsal feathers seen in the corresponding race of the Nilgiris. *Lori-*

* *Dicrurus longicaudatus* of Ceylon quite resembles that of India; whereas *D. macrocerus* of that island is constantly smaller. On the other hand, *D. macrocerus* is undistinguishable in India, Burma, and Java, while in Burma *D. longicaudatus* is replaced by the smaller but otherwise similar *D. intermedius*, nobis. The small Ceylon race of *D. macrocerus* I have elsewhere termed *D. minor*.

culus asiaticus, (Lath., v. *indicus*, Gmelin,) differs only from *L. vernalis* of India, Burma, and Java, in having the crown deep red, with an inclination to greater variation of hue on other parts. *Hirundo hyperythra* of Ceylon, as compared with *H. daurica*, (like *H. cahirica* as compared with *H. rustica*,) differs only in having the entire underparts very deep ferruginous. *Megalaima zeylonica* of Ceylon is merely smaller than *M. caniceps* of India, with the lower parts decidedly darker; and the Cinghalese representative of the rufous or bay Woodpeckers (*Micropternus*) is much deeper-coloured than those respectively of S. India, Bengal, and the Malay countries. On the other hand, *Halcyon gurlal* of Ceylon perfectly resembles that of India generally and of Burma, whereas the Malayan race (*H. leucocephalus*,) is smaller and of deeper hue with a coloured shine on the crown. So, also, *Orthotomus longicauda* is deeper-coloured in the Malayan peninsula than in India, but not so in Ceylon. In general, the Malayan species, unless obviously distinct, present no difference of shade from those of India and other countries to the northward; and the only additional instances we can call to mind of their being thus distinguished are those of *Trichastoma olivaceum* of the Malayan peninsula as compared with *Tr. Abbotti* of Arakan,—*Megalaima trimaculata* and *M. cyanotis* of the same countries respectively,—and *Picus moluccensis* and *P. canicapillus*, ditto:* the Tenasserim Hoopoe is very deep-coloured in comparison with that of Arakan, Bengal, and Europe, and seen sometimes in the Nilgiris; but the ordinary Hoopoe of S. India and Ceylon is smaller with the exception of its beak, and likewise rather deep-coloured.† The common Jungle-cock (*Gallus ferrugineus*) is again deeper-coloured in the Malayan peninsula and archipelago, besides being coarser in the leg, and wanting the conspicuous pure white cheek-lappet which so ornaments the Bengal Jungle-fowl. Also (so far as I have seen), the Malayan *Pavo muticus* is far more vividly coloured than that of Arakan; the latter being comparatively much darker. But we can neither generalize upon these facts, so as to predicate the like in other instances, inasmuch as the majority of species common to India and Ceylon or to India and the Malay countries do not appear to vary in the least degree, nor can we draw the dividing line as to what can be satisfactorily considered

* *Megalaima cyanotis* and *Picus canicapillus* inhabit also the Tenasserim provinces.

† I have never seen a Hoopoe from the Malayan peninsula.

species, as the gradations continue unbroken to the most marked specific types, and which still may hold a parallel in the respective regions, as the peculiar Jungle-fowl and Spur-fowl (*Galloperdix*) of Ceylon, as compared with their Indian congeners, may suffice to testify.

In poleward or very elevated regions we remark the contrary tendency of animals, to become paler in colour, whether particular species or evident varieties of those which inhabit elsewhere. For example, the Tibetan fauna generally would seem to exemplify this law; and several of the birds of Scandinavia as compared with those of Britain are deficient in colour, greys passing into white, and fulvous into white or grey. The only difference between *Sitta europæa*, L. (vel *S. asiatica* and *sericea*, Temminck, and *S. uralensis*, Lichtenstein,) of Scandinavia and the northermost parts of Europe generally, from *S. cæsia* of the rest of Europe, consists in the lower parts of the former being pure white where those of the latter are pale fulvous; and in *S. cinnamomeiventris* of the Himalaya, again, the only difference consists in the same parts being altogether of the deep and dark ferruginous which is confined to the flanks and lower tail-coverts only of the two preceding races. *Picus minor* and *Parus ater* and *P. palustris* of Scandinavia are thus readily distinguished from the corresponding races of Britain: and it is curious that *Orites caudatus* of the N. of Europe would appear to have invariably a pure white head, devoid of the dark sincipital bands which occur constantly upon this species in Britain.

There is yet another phenomenon which adds to the difficulty of discriminating species in some, though not many, instances; and this is the production of hybrid races and individuals of mixed origin of every grade of intermediateness. In some cases the hybrids are not known to reproduce, and so to form a race, as instanced by the mule grouse of Northern Europe (the cross between the Capercailzie and the Black Grouse), together with other hybrids produced by sundry wild *Gallinaceæ* and *Anatidæ*: but there are some hybrids which are quite as prolific as their parents, as among mammalia those raised between the humped and humpless domestic cattle, and among domestic birds the mixed progeny of *Anser cinereus* and *A. cygnoides*.* So in the

* All the domestic Geese of India (so far as I have seen) are of this mixed species, and in no animals can specific characters be more strongly marked than in the parent races, extending to the voice and habits. So with the cattle,—the

Himalaya and elsewhere the different races or species of *Kallij Pheasants* inter-breed, and the hybrids so produced again both *inter se* and with the pure parent races, whence every gradation from one to another may be traced in a series of specimens.* And the same is shewn with *Coracias indica* of India generally and *C. affinis* of the countries eastward, to the extent that in some districts it is difficult to procure either with quite the typical colouring; but we are not aware that the same happens in Sindh and its vicinity, with regard to *C. indica* and the equally *affined C. garrula*, which latter European species is there not uncommon. I know of no other decided intermixture of wild races of birds in India, though I have seen some reason to suspect it in the instance of *Treron phænicoptera* and *Tr. chlorigaster*; and perhaps also *Iora typhia* and *I. zeylanica*: as regards the latter at least, we occasionally obtain specimens in Bengal that had imperfectly assumed the black cap and dorsal plumage so constant in the old males of S. India and Ceylon, but I never saw this dress approaching to perfection in a Bengal specimen, and it may be an instance of climatal variation which gradually attains its ultimatum as we proceed southward in the Indian peninsula and Ceylon, though not in the corresponding and lower latitudes of the Malayan peninsula. There we have a remarkably different colouring in the male *I. scapularis*, Horsfield, which again is however a darkening of hue, though quite in a different way; and it remains to observe whether a gradation exists in the latter instance as in the former. The three exactly accord in size and structure, as in so many corresponding instances; but another and much larger *Iora* inhabits the whole eastern side of the Bay of Bengal, the male of which is *I. Lafresnayeii*, Hartlaub, and the female was subsequently named by me *I. innotata*.

These remarks have been thrown together preparatory to the draw-

hump is only one distinction, out of very many, but is nevertheless so characteristic of the animal as to be well exhibited at an early period of fœtal life; and the voice is again very different, and the habits in various particulars, especially in the fact of the European cattle seeking shade and water in hot weather, whereas the humped cattle seem indifferent to the hottest Indian sun, and never seek water to stand knee and belly deep for hours, as so beautifully pictured of the humpless race by the author of the 'Seasons.'

* This is well shewn in the Society's Museum. Vide *J. A. S.* XVIII., 817.

ing up of a list of all the birds of India, Burma, and the Malayan peninsula, with those of Sindh, Asám, Ceylon, the Nicobars, &c. (so far as I am able), in which I propose to offer such observations on the affinities of many of the species or races as may enable the student to draw his own conclusions respecting their claims to be regarded as species or as mere varieties. A bare list of names, especially if unaccompanied by synonymes, is oftentimes of little or no utility whatever as a guide, or even worse so often as mistakes in the determination of species occur, or those of the rarest and most casual occurrence are set down without a word of remark together with the commonest and most generally diffused. Where a constant variation, however trivial, obtains, it should be duly noted, and the value that the particular writer attaches to it is of small consequence: and it should likewise be distinguished whether the author writes from his personal knowledge or from the observations of others, if any authority is to attach to his production.

*Conspectus of the Ornithology of India, Burma, and the Malayan peninsula, inclusive of Sindh, Asám, Ceylon, and the Nicobar islands.**

—By E. BLYTH, Esq.

• Order I. SCANSORES.

Fam. PSITTACIDÆ.

Subfam. ARINÆ.†

Genus PALÆORNIS, Vigors.

Totá, Sugá, Hind. : Tiýá, Beng. : Girawa, or Rana Girawa, Cingh. : Kyet-ta-rwe, Arakan.

* The Andamans, with the Maldives and Laccadives, would also have been added, had more information been available respecting this branch of their fauna.

† The PARROT family divides naturally into five sub-families, of which the second and last are the most strongly characterized by peculiarities of structure.

1. CACATUINÆ (or Cockatoo group). Comprising the genera *Dasyptilus* (?), *Microglossum*, *Calyptorhynchus*, *Cacatua*, *Nestor*, and *Strigops* (with sub-divisions of the third and fourth). The first and second of these are peculiar to the Papuan islands. The third also occurs in N. Guinea, but is chiefly developed in Australia with Tasmania. The fourth inhabits (in different species) Australia, Papua, the Philip-

1. P. ALEXANDRI (Edwards, pl. 292).

SYN. *Psittacus Alexandri*, L.*Ps. eupatria*, L.*Psittaca ginginiana*, Brisson.

} the female.

Psittacus guineensis, Scopoli (nec *guineensis*, Gmelin).*Ps. Sonneratii*, Gmelin.*Palæornis nipalensis*, Hodgson, *As. Res.* XIX. 177.

pines, Moluccas, and Borneo. The fifth very recently comprised two species, one in N. Zealand, the other—already extinct—in the islet called Philip island near Norfolk island (the fauna and flora of which islands ally them chiefly with N. Zealand). The sixth, consisting of but one known species rapidly verging upon extinction (the crepuscular and Owl-like *Strigops habroptilus*, G. R. Gray), is also a N. Zealand lander.

2. PLATYCERCINÆ (or ground Parrakeets). Inhabiting N. Holland, with a few outlying species of *Platycercus* only in N. Zealand and Polynesia proper, and one *Aprosmictus* extending its range to N. Guinea. This group is nearly affined to the preceding one, but has a remarkable structural distinction from all other birds in the absence of bony clavicles, which in the rest of the *Psittacidae* (as in almost throughout the class) are united to form the *furcula* or “merry-thought” bone. The members of both of these sub-families are mainly eaters of grain and other farinaceous seeds, but some of the Cockatoos feed also largely on bulbs, and the *Calyptorhynchi* partly on large insect larvæ.

3. ARINÆ (or Macaw group). Chiefly S. American, one small species only occurring in the proximate regions of N. America; but with a subordinate division in S. E. Asia and its archipelago, Africa, and Australia, comprising the genera *Palæornis*, *Tanygnathus*, and *Agapornis*, with *Prioniturus* (which would seem to be intermediate to the first and second), in the former regions, and *Polytelis* in the last named. This eastern subgroup is less frugivorous than the western; and all would appear to be birds of vigorous flight, an attribute in which the whole family has been supposed deficient.

4. PSITTACINÆ (or ordinary Parrots). Chiefly S. American, with a few species in Africa and Madagascar, and a particular division comprehending *Ectectus* and *Loriculus* in S. E. Asia and its archipelago. N. B. This and the foregoing group are affined, and the species are, in general, much more frugivorous than the members of the two preceding subfamilies, and the *Psittacinæ* more so than the *Arinæ*, but the great majority feed also on hard grain.

5. LORIINÆ (or Lories). Peculiar to the Austral-asian archipelago, with Papua, Australia, and Polynesia. This subfamily is particularly distinguished by the peculiar structure of the tongue (varying somewhat in different genera), which is adapted for extracting the nectar from flowers; the species also feed upon soft fruits, but never on grain, and the beak is proportionally feeble.

Chauduná ('Sandal-wood coloured,' alluding to the yellowish tinge of the under parts and upper portion of the back), Beng.: *Karan sugá* and *Kararia* of Nepal (Hodgson): *Ráé Totá* ('Royal Parrakeet'), Hind. (Jerdon): *Kyai Phoungka*, Arakan (Phayre).

HAB. Hilly regions of all India proper, from the sub-Himalayas to Ceylon inclusive; Asám; Sylhet; Arakan; Tenasserim provinces.

2. *P. TORQUATUS* (Daubenton's *Pl. Enl.* 551).

SYN. *Psittaca torquata*, Brisson.

Psittacus Alexandri, var. B, Latham.*

Ps. cubicularis, Hasselquist.

Ps. docilis, Vieillot.

Ps. steptophorus, Desmarest.

Var. *Sulphur Parrakeet*, Shaw.

Tiyá (or *Teeyá*, imitative of voice), Hind.: *Tent'hia Suga*, Nepal (Hodgson): *Gallar* of some, H. *Lybar*, Masuri (Hutton): *Lybar Totá*, S. India (Jerdon): *Kyai-gyot*, Arakan (Phayre).

HAB. Plains of India; Ceylon; Asám; Sylhet; Arakan; Tenasserim provinces; Malayan peninsula (to latitude of Penang): W. Africa (apud Swainson), smaller variety.†

In general, the *Psittacidae* are exclusively vegetable-feeders, as much so as the *Columbidae*: but the *Calyptorhynchi* are described to cut up decaying trees, by means of their extremely powerful beaks, to get at the larvæ in the interior of the wood; and the *Loriinae* (at least in confinement) will eat soft maggots. This general diet of the group helps to bear out the analogy which the *Psittacidae* among birds bear to the *Quadrumana* among mammalia (though it is true that many of the *Quadrumana* are, in the wild state, far more omnivorous than is generally supposed). In their whole structure, the *Psittacidae* manifest no particular affinity (that we can discern) for any of the zygodactyle *Insectores*; but they decidedly constitute a very distinct ordinal type, shewing most relations with the diurnal *Raptores*: and regarding them as the most highly organized of birds, we do not hesitate to follow the arrangement of those zoologists who place them at the head of the class, parallel to the Apes and Monkeys among the mammalia.

* Except that there is no patch of crimson on the wing-coverts of *Ps. torquatus*.

† "The Rose-ringed Parrakeet," writes Mr. Swainson, "is one of the few birds of Senegal whose geographic distribution extends from east to west. Of four specimens in very perfect plumage now before us, three are from Western Africa and

Remark. This is the only Indian Parrot (so far as we are aware) that affects the vicinity of human habitations, flocks of them often settling upon buildings, especially if situate in gardens with trees about them, and one or more pairs occasionally breeding in suitable cavities about buildings. It is the only species observed wild in the densely populous neighbourhood of Calcutta, but in jungle districts becomes replaced by No. 4.

3. *P. SCHISTICERS*, Hodgson, *As. Res.* XIX. 178.

SYN.? *Conurus himalayanus*, Lesson, in Belanger's *Voyage*.

Mádana Sugá, Nepal (Hodgson): *Puhari Tuiya*, Masuri (Hutton): *Gúgi* of Calcutta bird-dealers.

HAB. Sub-Himalayan region (exclusively).

Remark. The Masuri name of this species (or 'mountain Tuia') well expresses its near affinity for the next. The adult sexes differ in the male having a small maroon spot on the wing, which is wanting or barely indicated in the female, and the black demi-collar is also rather more developed. The young have generally but a trace of the slaty-blue cap, but this is fully developed in some few specimens, though without the black demi-collar which borders this cap in the adult. The beak, which in *P. cyanocephalus* is bright yellow, is in the present species yellow tinged with coral-red, and in adults of all the other species is bright coral-red.

4. *P. CYANOCEPHALUS* (Edwards, pl. 233; Daubenton's *Pl. Enl.*, 264).

SYN. *Psittacus cyanocephalus*, L.

Ps. flavitorquis, Shaw.

Ps. annulatus, Kuhl.

Palæornis flavicollaris, Franklin.

Psittaca bengalensis, Brisson.

} the female.

one from Madras: between the first three of these, there is no difference whatever in size; but that from the East Indies is considerably larger; the length of its wing, in fact, measuring 7 in., while that of the Senegal race is not quite 6 in." *Birds of W. Africa*, II, 175. Of numerous Indian specimens examined, from all the above named localities, we have found the length of the wing to be very regularly $6\frac{1}{2}$ in., rarely $\frac{1}{2}$ in. more or less.

Psittacus erythrocephalus, Gmelin.

Ps. ginginianus, Latham.

Ps. rhodoccephalus, Shaw.

Var. *Ps. narcissus*, Latham (with coloured figure).

Faridi, and *Fariádi* ('plaintive'), Bengal; *Tui Sugá* (the first or specific name imitative of cry), Nepal (Hodgson); *Tuia Totá*, S. India (Jerdon); *Bengali totá*, Panjab; *Kyai-ta-ma*, Arakan (Phayre).

HAB. Upland and jungle regions of all India proper; Ceylon; Asám; Sylhet; Arakan; Tenasserim provinces. N. B. It occurs in open jungle, in the Bengal Sundarbans. To the westward, leaving the alluvial soil of the Ganges, it seems entirely to take the place of *P. torquatus* in the Midnapur jungles.

5. *P. MALACCENSIS* (Daubenton's *Pl. Enl.* 887; Levaillant, pl. 72).

SYN. *Psittacus malaccensis*, Gmelin (not Latham).

Ps. erubescens, Shaw.

Ps. ginginianus, var. C, Latham.

Ps. barbatulatus, Bechstein.

Bayan, Sumatra (Raffles); *Madná Bhola* of the Calcutta dealers.

HAB. Malayan peninsula; Sumatra.

6. *P. ERYTHROGENIS*, Blyth, *J. A. S.* XV, 23, 51, 368.

HAB. This beautiful species is common in the Nicobar Islands, and does not appear to have been hitherto observed elsewhere.

7. *P. CANICEPS*, Blyth, *J. A. S.* XV, 23, 51.

HAB. Nicobar Islands; Malayan peninsula (latitude of Penang).

Remark. Of this fine and strongly marked species, we have seen two specimens only; one with a coral-red beak, procured alive (with its wings and tail much mutilated) from a Nicobarian savage, and which is now in the Society's Museum; the other with a black beak, from Province Wellesley.

8. *P. BARBATUS* (Daubenton's *Pl. Enl.* 517; Swainson's *Zool. Ill.*, 2nd series, pl. 16).

SYN. *Psittacus barbatus*, *Ps. pondicerianus*, and *Ps. borneus*, Gmelin.

Ps. bimaculatus, Sparrman.

Ps. jaranicus, Osbeck.

Ps. Osbeckii, Latham.

Ps. mystaceus, Shaw.

Palæornis nigrirostris, Hodgson (the young female).

P. modestus, Fraser (the very young female).

Madná ('charming,' 'pleasing'), the red-billed bird;
Kájlá (as having the black pigment, *Kájal*, applied
 to the eye-brows; alluding to the black loreal line),
 the black-billed bird, Hind.; *Imrit Bhila*, Nepal,
 (Hodgson); *Bettet*, Java, (Horsfield).

HAB. Hilly parts of Bengal, Nepal, Asám, Sylhet, Arakan, Tenasserim, Malayan peninsula (to latitude of Penang), Sumatra, Java, and Borneo.

Remark. We have never seen this bird in Malacca collections, nor does it appear to occur wild in any part of the Indian peninsula or in Ceylon; hence the name *pondicerianus* cannot be adopted. Specimens from Java are perfectly similar to those of India. In a presumed female observed in captivity, the upper mandible changed from black to coral-red when the bird was about 18 months old.

9. *P. COLUMBOIDES*, Vigors (Jerdon's *Ill. Ind. Orn.*, pl. 8).

SYN. *P. m. anorhynchus*, Sykes,—the young.

Nadan-gowr Totá, II. (Jerdon).

HAB. Nilgiris; Malabar.

10. *P. CALTHRAPÆ*, Layard, *J. A. S.* XVIII, 800.

HAB. Mountainous interior of Ceylon.

Remark. In the adult specimen described, *loc. cit.*, the middle tail-feathers had not attained their full length: in three other adults since received, they are full grown but very short, measuring but from $4\frac{1}{2}$ in. to $5\frac{1}{2}$.*

* In this enumeration of the species of *Palæornis*, I have provisionally omitted to include a race (or slight variety of *P. torquatus*?) which inhabits Ceylon, and which I formerly supposed to be *P. bitorquatus*, Kuhl, judging from a female only which I had then reason to believe was procured in the Mauritius. Mr. Layard considers it distinct from the ordinary *P. torquatus* of Ceylon, &c., and has obligingly procured for me a living male not yet received.—Since the foregoing was in type, I have received a further communication from Mr. Layard, in which he mentions having obtained a number of skins. *P. bitorquatus*, a species which is

Genus TANYGNATHUS, Wagler.

11. *T. MALACCENSIS* (Swainson's *Zool. Ill.*, 1st series, pl. 154, the male? or adult of either sex?).

SYN. *Psittacus malaccensis*, Latham (nec Gmelin).

Ps. incertus, Shaw.

Tana, Malacca.

HAB. Malayan peninsula; Sumatra.

Remark. This species is essentially a small *Palæornis* with a short and sub-even tail, and is somewhat allied in its colouring to *P. columboides* and *P. Calthrapæ*, which last (as we have seen) has a shorter tail than the rest of its genus. *T. macrorhynchos*, upon which the present genus was founded, is also closely related to *Palæornis*, but upon a larger scale; and the two bear the same mutual relationship as subsists between *P. Alexandri* and *P. cyanocephalus*. Intermediate, we have *T. sumatranus*, (Raffles), and we believe *Ps. melanopterus*, Gm., and others, with the *Prioniturus setarius*, (Tem.), remarkable for the shape of its tail, which however may still be considered intermediate to those of *Tanygnathus* and *Palæornis*. In *T. sumatranus* (both sexes of which we have possessed together and studied alive), the male has a coral-red bill and the female a white bill; and the same would appear to obtain with *T. malaccensis* (if the difference of plumage in different specimens be characteristic of sex and not merely of age): and in the great *T. macrorhynchos*, the nearly affined but smaller and less powerfully billed *T. sumatranus*, and the small *T. malaccensis*, are alike perceived a peculiar yellow margining of the wing-coverts, which occurs in no species of *Palæornis*. Nearly affined again, we have the minute African and Madagascar species forming the genus *Agapornis*, to which *T. malaccensis* has by some been referred.

It remains to ascertain whether both *T. macrorhynchos* and *T. sumatranus* do not also inhabit the more elevated districts of the interior of the Malayan peninsula. In a collection which Capt. Charleton made at Malacca, there was a fine specimen of the former, but we are not aware that it was obtained wild in that vicinity, and rather doubt that either of these species occurs wild except in Borneo and to the eastward.

very little known, and is said to inhabit the island of Bourbon, is the only other *Palæornis* not included in the above list; the two Australian species being properly separated to form the genus *Polytelis*.

Subfamily. PSITTACINÆ.

Genus. LORICULUS, Blyth.

12. *L. GALGULUS* (Edwards, pl. 293, f. 2).

SYN. *Psittacus galgulus*, L.

Ps. pumilus, Scopoli.

Serindak, *Sindada*, Malacca ; *Serindit*, Sumatra (Raffles).

HAB. Malayan peninsula ; Sumatra.

13. *L. VERNALIS* (Swainson's *Zool. Ill.*, 2d series, pl. 1).

SYN. *Psittacus vernalis*, Sparrrnan.

Ps. galgulus apud Horsfield, *Lin. Tr.* XIII, 182.

Latkan ('pendent'), Hind., Bengal ; *Bhorá* or *Bhoará*, S.

India, (Jerdon) ; *Kyai-tha-da*, Arakan (Phayre) ; *Silindit*,

and *Silinditum*, Java (Horsfield).

HAB. Hilly parts of India, from the sub-Himalayan region to S. India ; also Asám, Sylhet, Arakan, Tenasserim, and Java.

Remark. We have never seen this species from the Malayan peninsula, nor the preceding one from any country where the present is found ; though both are extremely numerous in their respective habitats. *N. B.* Javanese specimens differ in no respect from Indian, though Dr. Horsfield states that the Javanese bird differs from *Ps. vernalis*—(*Mss. Carls.*) in size, and in the proportions of the wings to the tail." The latter may depend on the mounting in museum specimens.

14. *L. ASIATICUS* (Edwards, pl. 6).

SYN. *Psittacus asiaticus*. Latham.

Ps. indicus, Gmelin.

Pol-Girawa, Cingh.

HAB. Ceylon.

Remark. Peculiar as this species (or race) is to Ceylon, the names which have been applied to it are infelicitous. Its distinctive colouring from *L. vernalis* would appear to be constant (vide description in *J. A. S.* XVIII, 801). Nevertheless, it is so very closely affined to the Indian bird that many would prefer to regard it as a permanent local variety of the same species. Its distinctions from the Philippine *L. rubrifrons*, (Vigors), remain to be pointed out : and we have seen drawings of another, similar, but with the entire head as deep red

(from the S. of China?) *N. B.* Neither the *Eclecti* nor the *Loriculæ* have the tongue filamented as in the *Loriinæ*, with which they have been generally but quite erroneously classed. These two genera form a particular and peculiarly Asiatic division of the *Psittacinæ*, immediately preceding the *Loriinæ*. Such at least is the result of our long continued study of living specimens.

Here it should be remarked that the *Eos ornata* (*Psittacus ornatus*, Gmelin,) is stated by Raffles to inhabit the Malayan peninsula, but doubtless by mistake. With other Lories, &c., it is commonly brought by the Malays from the more eastern islands of the Archipelago, and may be frequently purchased in Calcutta and other ports.

Summary view of the distribution of the PSITTACIDÆ in India and the neighbouring countries. From the foregoing catalogue it follows that only two generic forms of *Psittacidæ* inhabit India, viz. *Palæornis* and *Loriculus*, nor are we aware that another occurs in all continental Asia, with the exception of *Tanygnathus* as exemplified by *T. malaccensis* in the Malayan peninsula, this species being however barely separable from *Palæornis*, and the peninsula itself belonging physically to the region of the archipelago, or *Indonesia*, as this region has been recently designated by Mr. Logan. *Tanygnathus* should accordingly be regarded as strictly an Indonesian form;—the Asiatic countries westward of Sindh, it does not appear that any species of Parrot has been observed;* and we know but little of those of Indo-China eastward of the British possessions on that side of the Bay of Bengal, or those of the southernmost provinces of China. In the great Indonesian or Austral-asian archipelago, the number of genera and of super-generic forms gradually increases to the eastward, where the Lories and species of white Cockatoo, also the two species of *Eclectus* among the *Psittacinæ*, and the large *Tanygnathi*, are met with in Borneo, Celebes, the Moluccas, and some of them even in the Philippines; forms of black Cockatoo appearing likewise in the Papuan group; while in Australia the *Psittacidæ* attain their maximum of development as regards the number of genera and of species, though the two generic forms of India and certain others of Indonesia are foreign to the Australian fauna.

* Lieut. Irwin remarks.—“The Parrot and Maina are scarcely natives of Turkestan, or at least of the country beyond the Oxus.” *J. A. S.* VIII., 1007. Surely neither of them is found there at all, i. e. any Parrot, *Acridotheres (gera)* or *Gracula*.

Sumatra and Java contain the large *Tanygnathi* perhaps as rarities, but no Cockatoo, nor *Eclectus*; and the only Lory, if any, is *Eos ornata*, which Sir St. Raffles reported by mistake (?) to inhabit the Malayan Peninsula.*

With regard to the distribution of *species* in India and the neighbouring countries, we first remark three of *Palæornis* (*Alexandri*, *torquatus*, and *cynocephalus*,) as common—with unimportant local exceptions—to all India from the sub-Himalayan regions to Ceylon inclusive, and also to the eastward in Asám, Arakan, the Tenasserim provinces, and *P. torquatus* as far southward as Penang. Others are much more local, as *P. Calthrapæ* which is confined to the mountains of Ceylon, *P. columboides* to those of S. Indiá, *P. schisticeps* to the sub-Himalayan regions, and *P. erythrogeis* (so far as known) to the Nicobar islands. Of *P. caniceps* we know of but two examples, one procured in the Nicobars, the other at or near Penang; and this may prove to be properly a species of Indo-China. In the hilly parts of Bengal, and along the S. E. sub-Himalayan regions, in Asám, Sylhet, Arakan, the Tenasserim provinces, and the Malayan peninsula to the latitude of Penang, *P. barbatus* abounds, and is common also in Sumatra, Java, and Borneo; but it is unknown in the Indian peninsula (though having for a synonymy the name *pondicerianus*), and it would seem equally so in the southern parts of the Malayan peninsula. In these latter countries its place would seem to be taken by *P. malaccensis*; and the range of *Tanygnathus malaccensis* and of *Loriculus galgulus* corresponds. In Malacca collections I have seen only the three last named species, added to which in Penang collections I have seen *P. torquatus*, *P. barbatus*, and one specimen of *P. caniceps*: while another of this last is the only Parrakeet which I have seen from the Nicobars in addition to *P. erythrogeis*. It is probable that both of these also inhabit the Andamans and the northern part of Sumatra. Of *Loriculus*, while *L. galgulus* would appear to be confined to the Malayan peninsula and Sumatra, and *L. asiaticus* (so

* We suspect that Raffles's statement of *Tanygnathus sumatranus* (of which he describes the female only, apparently from a captive individual,) inhabiting Sumatra, needs confirmation as much as that of *Eos ornata* inhabiting the Malayan peninsula. Dr. Horsfield does not mention any *Tanygnathus* or Lory as occurring in Java.

called) to Ceylon, *L. vernalis* ranges over the hilly regions of all India, with Asám, Arakan, the Tenasserim provinces, and also Java; like *Palæornis barbatus*, and similarly without invading (as it would seem) the regions tenanted by *L. galgulus* together with *P. malaccensis* and *Tanygnathus malaccensis*. It may further be remarked that the whole of these species are such as no zoologist would hesitate in regarding as indisputably distinct, with the exception of *Loriculus asiaticus*, which some would consider to be a local variety of *L. vernalis*; in which case the race of the Philippines (*L. rubrifrons*) and another we have seen figured with the entire head crimson, should likewise rank as varieties merely of *L. vernalis*.

Notice of Lieut. STRACHEY'S Scientific Enquiries in Kumaon.

From J. THORNTON, Esq. Secretary to Government, N. W. P.

To Secretary, Asiatic Society, Calcutta.

SIR,—I am desired by the Honorable the Lieutenant-Governor, N. W. P. to request that you will lay before the Asiatic Society, the annexed copy of a letter from Lieutenant R. Strachey, Bengal Engineers, who has lately been engaged on scientific enquiries in Kumaon, under the orders of this Government.

2. Lieutenant Strachey has embarked for England in the March Steamer from Calcutta, carrying with him all his papers and collections, which will be placed at the disposal of the Honorable the Court of Directors.

3. Lieutenant Strachey had not sufficient time after his return from Kumaon, to prepare any of his papers for publication. This will be more advantageously and easily done in England. My present communication is designed to inform the Society, and through them the public generally, of the nature and extent of Lieutenant Strachey's researches, and of the quarter, whence further information respecting them may be expected.

I have the honor to be, Sir,

Your obedient humble servant,

J. THORNTON,

Agra, the 25th March, 1850.

Secy. to Govt. N. W. P.

From Lieut. R. STRACHEY, Esq.

To J. THORNTON, Esq. Secretary to Government, N. W. P.

SIR,—I have the honor to inform you that, in accordance with the permission granted to me by the Honorable Lieutenant Governor, I left Kumaon on the 4th Ultimo, having then brought to a conclusion my operations in that province.

In my letter to your address of the 3d April 1849, I explained fully the progress that I had made in my undertaking up to that date, and it will now therefore be only requisite that I should state what has been done in addition since that time, and to submit for the consideration of the Honorable Lieutenant Governor, my views as to the plan that should be adopted for the publication of the results of my enquiries.

The first object to which my attention was directed, the construction of the section of the Himalaya explanatory of its Botanical Geography, is still of necessity left incomplete; but the materials for its compilation are very ample, and the additional knowledge that has been acquired by Major Madden and myself during the past year, will be of much value in completing this part of my undertaking.

The provisional drawings of that part of the line which was best known, to which I referred in my letter above alluded to, were completed and have been submitted to the Honorable Lieutenant Governor. A memoir to accompany and explain these drawings was drawn out by Major Madden, but owing to my not having had any opportunity of conferring with that gentleman on the matter and to my attention having been unavoidably diverted to other objects that came more immediately before me, this paper has not been yet brought into a form suitable for publication.

The whole of my herbarium which now contains upwards of 2,000 species is now on its way to Calcutta, whence it will be sent on to England. On its arrival there I propose to undertake the comparison of the whole of it with properly named specimens, such as are to be found in the great Botanical collections in Europe, and then to draw out a fresh section with all the care that can be bestowed upon it.

I should likewise propose to draw out, if it be practicable, a catalogue of all the plants contained in my herbarium. This would form a valuable index to the Botany of this part of the Himalaya, and in it could be embodied descriptions of new plants, and identifications of synonyms,

besides some short description of the nature of each plant and the locality in which they are found.

I have greatly increased my knowledge of the Geological structure of Kumaon and Gurhwal during the past year, and I have added to my former collections a very considerable number of fossil shells &c., from the northern part of the mountains, from which I feel confident that the geological age of the strata in which these are found may be perfectly ascertained; and on the whole I consider that I shall be able to draw out a very fair geological map of Kumaon and Gurhwal, as well as geological sections such as were at first proposed.

My geological specimens are also now on their way to England with the herbarium.

In the department of Zoology matters are just as they were; the few specimens that I collected have likewise been dispatched to Calcutta.

The panoramic drawing of the mountains from the summit of Binson, has been completed, as I before said it had begun; this has also been laid before the Honorable Lieutenant Governor.

During the past season also my brother Captain H. Strachey, 66 Native Infantry, and I have been able to make some important additions to the topography of the country to the north of the snowy range in Kumaon and Gurhwal, by fixing, by trigonometrical operations, the position of the celebrated peak of Kailas, and of several other points of note. A map showing the combined result of this work and what was before known of this country has been executed by my brother, and has been shown to the Honorable Lieutenant Governor.

The calculations, on which the constructions of the map rests, were worked out by me sufficiently to permit of its being executed, but they take much time and must be carefully revised before any numerical results are published.

The meteorological observations which I was anxious to undertake have been conducted with as great care as was possible, and I have collected a considerable map of materials, which will I trust be a valuable addition to our knowledge of the phenomena in question. Besides other ordinary registers, I was enabled with the help of my brother Captain H. Strachey to make horary observations for a period of 24 hours at an elevation of 18,400 feet, as well as similar horary observa-

tions for periods of several days in succession both at Nifi, at about 11,500 feet, and at another place at a height of about 16,500 feet above the sea. I propose to undertake the reduction of these observations as soon after my return to England as is possible.

Magnetic observations of dip and intensity have been made by me at a great number of stations in Kumaon and Gurhwal, up to the elevation of 18,400 feet. On my way down to Calcutta, I have also observed the dip at some of the places at which I stopped.

In conclusion it appears to me that the best form in which the result of my enquiries in Kumaon can be published is, as a work on the Physical Geography of this part of the Himalaya. It is of course out of my power to offer to undertake any thing of this sort from my own private resources, but should the Honorable Court of Directors consider that the information which I have acquired is of sufficient value to induce them to give their countenance to such a work, and should they be satisfied with my ability to execute it in a becoming way, I shall consider it to be my first duty to undertake it and to devote myself entirely to its completion.

I have the honor to be, &c.

(Signed) R. STRACHEY,

Late on special duty in Kumaon.

(True Copy)

J. THORNTON,

Assistt. Secretary to the Govt. N. W. P.

Calcutta, the 7th March, 1850.

Memorandum relative to the Storms of Wind experienced in Tartary, with suggestions relative to them, for the Mission proceeding there.
—By HENRY PIDDINGTON, *President of Marine Courts.*

The following Memorandum was drawn up for the use of the Mission proceeding to Chinese Tartary in 1847, which, as then announced, expected to winter at Yarkund. Documents of this nature are, the Editors think, always worthy of permanent record, inasmuch as they fulfil their object not only at the time, but in future, when other expeditions or opportunities for observation may occur, and are moreover scientific notes which are too useful to be lost, and do not readily occur in all their bearings to any but those whose minds have been directed to the questions to which they relate.—Eds.

1. Heavy storms of wind, which either from their violence, or their veering to different points while blowing, or from both, are by all

writers, from the Chinese travellers and Marco Polo down to Humboldt and Ehrmann, called *Hurricanes*, are undoubtedly most frequent, both in the steppes and mountain chains of Tartary and Siberia.

2. Now as connected both with Meteorology in general, and especially with the new science of the Law of Storms these *land hurricanes* in all countries are of the highest interest, but in the countries above named especially so, for the elevation, cold, and dryness of the air may developé phænomena of importance tending to disclose to us their *causes*, or they may furnish us with confirmations or modifications of the laws now supposed to govern storms.

3. There are two great questions arising on the consideration of them which are—

A. Are they *strait-lined* currents of air, blowing from one point to another? or are they curves, and thus parts of rotatory storms? and if so which way do they turn? and do they move onwards also?

B. Where are they formed? and how do they begin? at the surface of the earth? or in the atmosphere? in a word, are they, like water-spouts, *descending* storms?*

4. The first question is easily solved if we have only observations. If the wind is a strait stream there will be no change in its direction while blowing. If it is part of a circular storm moving onwards the wind will veer according to fixed laws. If it be a circular storm, but *stationary*, as some are, it will *seem* to be a strait blowing wind at the place of the observer, but if observations at a distance can be had, then it will be seen that it was *really* blowing in a circle or curve.

5. To explain this I send herewith a transparent horn-card on which the winds are marked as they turn (against the hands (hours) of a watch) in the northern hemisphere. In the southern hemisphere they turn *with* the hours.

6. This card may be supposed to represent any sized rotatory storm, from a tornado of 100 yards to a storm of 1000 miles in diameter.

7. Now Humboldt and other travellers in Siberia speak of “Horrible tempests” of wind and rain from the plains of Tartary from the

* There is some evidence, which will appear in a work I am now printing tending to shew that hurricanes at sea are descending storms! hence the great importance of this query. . .

S. E. It will be seen by looking at the wind card, that supposing the wind due S. E. throughout the storm, it may be part of a great circle of wind and if it veers at all, that, as we shall shew presently below, it must be travelling along on a certain track.

8. For : make a mark with a fly on a sheet of paper to represent the place of observation.

Place the horn card with the point marked E. N. E. upon the flag. This is we will suppose the state of things when the E. N. E. wind is rising to the strength of a gale.

9. Now move the card gradually over the flag *to the left* till the S. E. point is over it, and it will be seen that the wind has gradually become E. b. N., East, E. b. S., E. S., E. S. E. b. E. and S. E. and that such veering of the wind indicates a circular storm moving up *from* E. b. S. to W. b. N. In such a case the greatest violence will be felt and the Barometer will be lowest when the wind is about E. b. S. because then the centre is nearest.

10. Again : put the card at the S. E. *wind-point* over the flag and move it up *to the right* till the N. W. wind-point comes over the flag.

Now, at half-way you will see that the flag is at the vacant space in the centre of the card. This is *the centre of the hurricane*, in which, between the Tropics, there is most frequently a dead calm before the shift, but often none, and the wind shifts or veers very rapidly to the opposite quarter or thereabouts, and blows as hard as ever.

11. This is the case of a storm moving up *from* the S. W. to the N. E. and its centre passing exactly over you.

12. We do not know that all or any part of this will occur, but it is easy to know if it does, if the veering of the wind be registered ; and at the same time the Barometer, or Simpiesometer, or both. I give now two suppositious registries of storm days, such as would be invaluable to us.

No. I.

September 15th, 1847.—At 9 A. M. encamped at Chuen-lung, the guide predicting a storm.

Secured every thing. My tent between two rocks just at the entrance of a little defile, whence a good view of the plain to the east, south, and round to N. W. and by a few paces round the rock the rest of the horizon could be seen. 9½ A. M. wind E. N. E. Bar.

— Ther. — wind piercing cold, and rising and falling with a sort of moaning noise.

Sky, light, hazy, vapory blue, and very thin sheets of scud flying from N. E. and north.

10 A. M. Blowing hard at E. b. N.

Bar. — Ther. —.

Strong haze above, dust-storm below, like those on the plains of India in the hot winds.

Noon: hurricane at due East tearing up everything; tent would go if not for the shelter of the rocks, Bar. — Ther. —.

Wind cold, some blasts warmer; blowing in heavy squalls. Barometer evidently oscillating with the squalls. Packed it up for fear of accident. At 12h. 45m the horizon one mass of dust, but a singular blue circle above us comparatively clear: subtends an arch of 45° or 50°.

1 P. M. more interval between the blasts. Wind E. S. E. Ther. —

2 P. M. wind S. E. b. E. more moderate but blowing hard.

2.30 P. M. moderate but strong gale at S. E. Set up Barometer again, Bar. — Ther. —.

3 P. M. moderating fast and our guides say all is over.

During the whole of the storm the dryness remarkable.

By shading the eyes, faint flashes of lightning could be seen. No thunder heard; but the roaring of the wind would prevent it if the thunder was not loud.

Guides say sometimes thunder, sometimes not; and that though it never rains with these storms in summer; in winter it snows with them; but they cannot say if the snow falls or drifts like the dust. They say that sometimes there is a dead calm in the middle of the hurricane, and that the wind then comes from the opposite quarter and that these are the most violent storms. They speak of these with much dread.

No II.

At Iskardo, October 22nd.—Our landlord sent his servants to secure all the doors and windows, saying we were going to have a storm.

Sky clear, but from the gallery to the S. W. a dense low lead-coloured cloud could be seen about ten degrees in altitude and subtending an arch from south nearly to west. Sky hazy, no scud or drift. Sun rose

very red. Wind south and light, rising and falling with a moaning noise. At 10 A. M. wind S. E. blowing very strong in squalls. Bar. — and oscillating about, .03 to .05 every quarter of an hour or less. Ther. —. The whole horizon is now covered with a sort of dark haze which is, I suppose, mostly dust. No rain. Above clear hazy blue sky with very thin wreaths of scud flying to the N. W. very fast, and these are thicker and more numerous towards the dark haze and in the S. W. than at the zenith when they disappear. 10h. 30m. Bar. — Ther. —. Wind steady at S. E. Bar. oscillating .05 to .07 in the squalls of wind, which are now almost of hurricane strength, &c. Noon, a hurricane from S. E. roaring heavily; the sky one mass of dust mingled with spiculæ of ice or snow. Impossible to look to windward. Tiles and planks flying about like feathers. Our landlord says that many persons are hurt and some killed in these storms. Bar. oscillates much less. *Wind seems to oscillate also* being from S. E. to E. S. E. or even East (as far as we can judge) and then coming back to S. East again.

At 12° 30' it fell a dead calm in a few minutes. Bar. — Ther. — a slight feeling of oppression.

At $\frac{1}{4}$ to 1 P. M. we heard a low roaring sound which gradually became louder and at 1 the hurricane burst forth again from the S. W. with a few sharp flashes of lightning (but no thunder) blowing harder than before. Bar. at 1 P. M. — Ther.

1.	30.	} P. M. Bar.	Ther.
At 2.			
2.	30.		
		&c. &c. &c. to the end of the storm.	

13. A set of observations like this; i. e. one or more storms carefully observed throughout, with all the details (*and the more details the better*) would be invaluable from these countries. Notes on the common dust-whirlwinds also, whatever be their size, will be useful in explaining what is desired as to them. Every thing in fact relating to the phænomena of wind and its attendant clouds, electricity, &c. must be of interest and probably of use. The question also of the existence of any thing like the Simooms of the Sahara in the desert of Cobi* would be worth settling.

14. If any knowledge on the subject of these tempests can be col-

* During the summer.

lected from guides, travellers, &c. it may be valuable, and I add a few queries which will suggest more.

15. If it could be possible to establish the dates of the occurrences of storms at various points we might thus also obtain other evidence of their progression and routes, as also of their rates of travelling. Thus if a storm was felt at Yarkund on the 10th, and at Iskardo on the 13th, and we found that it *was* travelling to the S. westward at Yarkund the probabilities then are, that it is the same storm which has taken three days to pass over this distance. If its passage over an intermediate station was known this would be a certainty. At sea circular storms travel from $1\frac{1}{2}$ up to 48 miles an hour on their tracks.

Queries to be put as occasion offers to guides, travellers, head-men of villages, &c.

1. What are the names by which you call the different kinds of whirlwinds and storms of wind of all kinds, large and small?

2. Why do you call them by those names? Are the names only those of their deities, &c. or because of their motion, or of their effects?

3. Are these names Tartar or Chinese?

4. Do you know the kinds of wind-storms which the Chinese call by the names of

A. *Tae-fung* (great wind).

B. *Kow-fung* or *fung-kou* (great turning wind?)

C. *Tee-hwuy* (Iron whirlwind).

D. *Tee-kew* (Iron whirlwind).

E. A noise before the typhoon called *Läen-fung* (a typhoon brewing), or any other kinds, and what are their Chinese and Tartarian names?

5. What are the effects of these various winds?

6. What are the Tartar names of the different gods or spirits of the winds?

7. Do you know of the goddess or spirit called by the Chinese *Keu-woo*? (The typhoon-mother).

8. Have you, or the Chinese, any temples dedicated to the spirits of the winds?

9. Have you any particular quarter of the heavens from which the storms come; like what the Chinese call *Luy-chow* (or the region of the thunder)?

10. What sacrifices are performed at the wind temples ?

11. Do you, or the Chinese, express the dread you have of these storms by the Chinese words *Chung wei che*. (There is a sincere awe or dread of it (the typhoon) ?

12. Do you express the termination of the storm by the Chinese words *Loc-se* (falling in the west) ?

13. How long do these storms last ; and what is the longest and shortest time of their duration ?

14. How do they begin ?

15. How do they continue ? strait from the same quarter or turning ?

16. How do they turn ?

17. Do they always turn the same way ?

18. At what time of the moon do they usually occur ?

19. How often in the year ?

20. Give the dates, years, and months of any of those which are recollected as being particularly violent, and where they occurred ?

21. In what parts are they most violent ?

22. And at what season of the year do they occur mostly, and when most violently ?

23. Are they storms of wind and dust only ; or of hail or snow or rain ?

24. Do the winter storms last longer than the summer ones ?

25. Do they ever overwhelm travellers, caravans, &c. and when and where does this occur ?

26. Do you know of their approach by any signs ; and what are these signs (sun, moon, stars, clouds, noises, behaviour of animals, &c.) ?

27. Are there (in the summer) any *hot* whirlwinds ? Describe them.

28. Is there ever a calm in the middle of the heavy wind-storms, and then does the wind begin to blow hard again, and is it then from the same point ?

29. Have you yourself been in these storms ?

30. Do they hurt your crops, or gardens, or animals ?

31. Do they ever seem to burn up the grass where they pass ?

32. Is there any thunder and lightning with them or at the end ?

33. Do they destroy houses if not well built ?

34. Are they most violent in the hills and mountain passes, or at the foot of them or when altogether in the plains?

35. In what countries are they most violent; i. e. do they do most mischief?

36. Have the volcanoes and the hurricanes any connection; that is, did you ever hear or know that the eruption of the volcanoes caused hurricanes?

37. Are there any parts of the country which you know or of which you have heard that cannot be traversed on account of the storms and when does this occur?

Of course no one individual will be able to reply to all these questions, but from the priests and head-men down to the guides, each may give his quota and their replies may lead to more information.

The religious part of the queries is of interest as like the other Chinese ones, it may shew the connection between the Chinese maritime storms and deities and the inland ones.

P. S. As illustrating this singular phenomenon of inland hurricanes, I add here a passage from the forthcoming new edition of the Sailor's Horn-Book, from which it would appear that hurricanes (as to violence) are perfectly well known to the Tchukutskoi of Behring's Straits! and they are also most frequent and severe, and true revolving storms in Iceland! See Vol. XIV. p. 297, of Jameson's Edinburgh Journal of Science in a paper on the Glaciers and climate of Iceland by W. Sartorius Von Walterhausen.

"Kotzebue in the *Rurick's* voyage of discovery, Vol. II. p. 160 of the 8vo. edition, describes a storm of hurricane violence on the 13th April, in Lat. $44^{\circ} 30'$ N. Long. 181° West, but he gives no account of the veering of the wind. Again in the voyage of the *Rurick*, Vol. I. p. 264, after a smart gale in the neighbourhood of the St. Lawrence Islands he was informed by the Tchukutskoi of St. Lawrence's Bay on the Asiatic Coast of Behring's Straits in $65^{\circ} 46'$ North "that the time of violent storms was at hand, and that the last had been only a faint wind. He gave us to understand that in a real storm nobody was able to stand on their legs, but that they were obliged to lay themselves flat on the ground." This is exactly, as to violence, the description which a Carib of the West Indian islands might have given to Columbus, or which a Mauritius or Jamaica negro would give of their hurricanes in

the present day. I have heard it often said in descriptions of hurricanes there, by persons of all classes, that fearful that the dwelling-house might be blown down the family crept on the ground on all fours (lying flat down when the gusts were most furious) to reach the nearest negro hut or other low sheltered spot ; or a "hurricane house" built of stone for such occasions. Are these Behring's Straits storms analogous to those which arise in the interior of the continent of North America and pass out to sea over Newfoundland ? and do the Asiatic storms arise in the plains of eastern Siberia and travel out towards Behring's Straits ?"

Tables of Mortality according to the experience of the Bengal Civil Service, with the values of Annuities, Assurances, &c.—By Capt. J. C. HANNYNGTON, Bengal Army.

The following tables are founded on the data contained in a general list of the Civil Service of the Bengal Presidency which was published some years ago by Ráinchander Dás under the superintendence of the Hon'ble H. T. Prinsep. A slight liberty has been taken with the ages under 25, in order to avoid irregularities in the premia for short assurances. The deviation is however small, and from 25 to 60, the actual data are very closely followed. After 60 the experience is too limited to be serviceable, and the table was thence continued and joined to the Northampton table by means of a curve and its ordinates.

The rate of mortality though higher than the English rates, is much more favourable than that determined by Mr. Woolhouse for the Bengal Military. The resulting rates of assurance premia are accordingly considerably less than those now used by Assurance offices. Nevertheless the rates here exhibited are beyond doubt sufficient ; for Mr. Nelson's recent investigations on military lives give still lower rates, and hence it may be fairly inferred that the civil experience if further extended would lead to further reductions.

These remarks may serve to justify the publication of these tables, by shewing that they are fit to be used. The allusion to assurance rates will not it is hoped, be thought misplaced. It springs naturally

out of the subject, and vital statistics unless applied to the *business* of life assurance are of little worth. The tables have been prepared with attention to practical details, for practical purposes, in hope that they may be found useful.

It has not been considered necessary to add a summary of formulæ adapted to Commutation tables. They can be readily obtained by those who may require them.

TABLE I.—*Law of Mortality, Bengal Civil Service.*

Age.	Number that complete each year of age.	Number that die in the next year of age.	Sum of the living at all ages.	Mean duration of life.	Useful logarithms.			
	l_x	$l_x - l_{x+1}$	$\Sigma (l_x)$	e_x	$\log. l_x$	$colog. l_x$	$\log. p_x$	$colog. p_x$
20	9085	153	274798	30.00	9583249	0416751	9926238	0073762
21	8932	151	265713	29.50	9509487	0490513	9925953	0074047
22	8781	149	256781	28.99	9435440	0564560	9825674	0174326
23	8632	148	248000	28.47	9361114	0638886	9924893	0075107
24	8484	147	239368	27.96	9286007	0713993	9924091	0075909
25	8337	147	230884	27.43	9216798	0789902	9922741	0077259
26	8190	145	222547	26.91	9132839	0867161	9922321	0077679
27	8045	145	214357	26.38	9055260	0944710	9921011	0078989
28	7900	144	206312	25.62	8976271	1023729	9920107	0079893
29	7756	144	198412	25.08	8896378	1103622	99181610	0018390
30	7612	145	190656	24.55	8814988	1185012	9916474	0083526
31	7467	145	183044	24.01	8731462	1268538	9914835	0085165
32	7322	146	175577	23.48	8646297	1353703	9912527	0087473
33	7176	146	168255	22.95	8558824	1441176	9910729	0089271
34	7030	146	161079	22.41	8469553	1530447	9908856	0091144
35	6884	148	154049	21.88	8378409	1621591	9905612	0094388
36	6736	151	147165	21.35	8284021	1715979	9901537	0098463
37	6585	154	140429	20.83	8185558	1814442	9897227	0102773
38	6431	157	133844	20.31	8082785	1917215	9892660	0107340
39	6274	160	127413	19.81	7975445	2024555	9887809	0112191
40	6114	165	121139	19.31	7863254	2136746	9881186	0118814
41	5949	167	115025	18.83	7744440	2255560	9876341	0123659
42	5782	171	109076	18.37	7620781	2379219	9869622	0130378
43	5611	174	103294	17.91	7490403	2509597	9863190	0136810
44	5437	176	97683	17.47	7353593	2646407	9857090	0142910
45	5261	178	92246	17.04	7210683	2789317	9850518	0149482
46	5083	179	86985	16.61	7061201	2938799	9844304	0155696
47	4904	181	81902	16.20	6905505	3094495	9836674	0163326
48	4723	181	76998	15.80	6742179	3257821	9830292	0169708
49	4542	180	72275	15.41	6572471	3427529	9824386	0175614

Age. <i>x</i>	Number that complete each year of age.	Number that die in the next year of age.	Sum of the living at all ages.	Mean duration of life.	Useful logarithms.			
	l_x	$l_x - l_{x+1}$	$\Sigma (l_x)$	e_x	$\log. l_x$	<i>colog.</i> l_x	$\log. p_x$	<i>colog.</i> p_x
50	4362	180	67733	15.03	6396857	3603143	9816983	0183017
51	4182	179	63371	14.65	6213840	3786160	9810016	0189984
52	4003	176	59189	14.29	6023856	3976144	9804729	0195271
53	3827	175	55186	13.92	5828585	4171415	9796723	0203277
54	3652	173	51359	13.56	5625308	4374692	9789236	0210764
55	3479	168	47707	13.21	5414544	4585456	9785048	0214952
56	3311	166	44228	12.86	5199592	4800408	9776614	0223386
57	3145	163	40917	12.51	4976206	5023794	9768870	0231130
58	2982	159	37772	12.17	4745076	5254924	9762033	0737967
59	2823	155	34790	11.82	4507109	5492891	9754749	0245251
60	2668	150	31967	11.48	4261858	5738142	9748699	0251301
61	2518	147	29299	11.14	4010557	5989443	9738759	0261241
62	2371	142	26781	10.80	3749316	6250684	9731785	0268215
63	2229	138	24410	10.45	3481101	6518899	9722439	0277561
64	2091	135	22181	10.11	3203540	6790460	9710149	0289851
65	1956	130	20090	9.77	2913689	7086311	9701319	0298681
66	1826	127	18134	9.43	2615008	7384992	9686926	0313074
67	1699	122	16308	9.10	2301934	7698066	9676383	0323617
68	1577	118	14609	8.77	1978317	8021683	9662236	0337764
69	1459	114	13032	8.43	1640553	8359447	9646670	0353330
70	1345	110	11573	8.10	1287223	8712777	9629447	0370553
71	1235	104	10228	7.78	0916670	9083330	9617956	0382044
72	1131	100	8993	7.45	0534626	9465374	9597961	0402039
73	1031	95	7862	7.13	0132587	9857413	9580171	0419829
74	936	90	6831	6.80	9712758	0287242	9560946	0439054
75	846	85	5895	6.47	9273704	0726296	9540143	0459857
76	761	80	5049	6.13	8815847	1186153	9517624	0482376
77	681	75	4288	5.80	8331471	1668529	9493255	0506745
78	606	70	3607	5.45	7824726	2175274	9466922	0533078
79	536	67	3001	5.10	7291648	2708352	9420080	0579920
80	469	63	2465	4.75	6711728	3288272	9373532	0626468
81	406	60	1996	4.41	6085260	3914740	9305501	0694499
82	346	57	1590	4.09	5390761	4609239	9218217	0781783
83	289	55	1244	3.80	4608978	5391022	9083181	0916819
84	234	48	955	3.58	3692159	6307841	9006970	0993030
85	186	41	721	3.37	2695129	7304871	8918551	1081449
86	145	34	535	3.19	1613680	8386320	8839550	1160450
87	111	28	390	3.01	0453230	9546770	8737551	1262449
88	83	21	279	2.86	9190781	0809219	8733136	1266864
89	62	16	196	2.66	7923917	2076083	8703661	1296339
90	46	12	134	2.41	6627578	3372422	8687211	1312789
91	34	10	88	2.09	5314789	4685211	8487323	1512677
92	24	8	54	1.75	3802112	6197888	8239088	1760912
93	16	7	30	1.37	2041200	7958800	7501225	2498775
94	9	5	14	1.05	9542425	0457575	6478175	3521825
95	4	3	5	0.75	6020600	3979400	3010300	6989700
96	1	1	1	0.50	0000000	0000000	0000000	0000000

TABLE II.—Annuities, Assurances, &c. Four per Cent.

Age x.	D.	N.	S.	M.	R.	Annuity. a_x
20	4146.28	62701.09	864804.71	1575.218	31014.528	15.122
21	3919.66	58781.43	802103.62	1508.077	29439.310	14.998
22	3705.19	55076.24	743322.19	1444.361	27931.233	14.865
23	3502.23	51574.01	688245.95	1383.908	26486.872	14.726
24	3309.79	48264.22	636671.94	1326.170	25102.964	14.582
25	3127.35	45136.87	588407.72	1271.028	23776.794	14.433
26	2954.04	42182.83	543270.85	1218.007	22505.766	14.280
27	2790.14	39392.69	501088.02	1167.718	21287.759	14.119
28	2634.47	36758.22	461695.33	1119.364	20120.041	13.953
29	2486.97	34271.25	424937.11	1073.190	19000.677	13.780
30	2346.92	31924.33	390665.86	1028.793	17927.487	13.603
31	2213.67	29710.66	358741.53	985.806	16898.694	13.421
32	2087.19	27623.47	329030.87	944.472	15912.889	13.235
33	1966.90	25656.57	301407.40	904.454	14968.417	13.044
34	1852.77	23803.80	275750.83	865.976	14063.962	12.848
35	1744.51	22059.29	251947.03	828.977	13197.986	12.645
36	1641.35	20417.94	229887.74	792.914	12369.009	12.440
37	1542.84	18875.10	209469.80	757.535	11576.095	12.237
38	1448.81	17426.29	190594.70	722.841	10818.560	12.028
39	1359.08	16067.21	173168.41	688.832	10095.718	11.822
40	1273.48	14793.73	157101.20	655.506	9406.886	11.617
41	1191.45	13602.28	142307.47	622.460	8751.380	11.417
42	1113.47	12488.81	128705.19	590.300	8128.920	11.217
43	1038.98	11449.83	116216.38	558.636	7538.621	11.020
44	968.038	10481.792	104766.546	527.656	6979.984	10.828
45	900.675	9581.117	94284.754	497.525	6452.328	10.638
46	836.732	8744.385	84703.637	468.224	5954.803	10.451
47	776.218	7968.167	75959.252	439.891	5486.579	10.265
48	718.816	7249.351	67991.085	412.344	5046.688	10.085
49	664.681	6584.670	60741.734	385.856	4634.344	9.909
50	613.788	5970.882	54157.064	360.528	4248.488	9.728
51	565.827	5405.055	48186.182	336.174	3887.960	9.553
52	520.777	4884.278	42781.127	312.887	3551.786	9.379
53	478.731	4405.547	37896.849	290.870	3238.899	9.203
54	439.269	3966.278	33491.302	269.821	2948.029	9.029
55	402.366	3563.912	29525.024	249.813	2678.208	8.857
56	368.207	3195.705	25961.112	231.130	2428.395	8.679
57	336.295	2859.410	22765.407	213.379	2197.266	8.503
58	306.601	2552.809	19905.997	196.620	1983.886	8.326
59	279.090	2273.719	17353.188	180.901	1787.266	8.147

TABLE II.—(Continued).

Age x.	D.	N.	S.	M	R.	Annui- ty. a_x
60	253.621	2020.098	15079.469	166.167	1606.3653	7.965
61	230.156	1789.942	13059.371	152.456	1440.1988	7.769
62	208.384	1581.558	11269.429	139.536	1287.7428	7.590
63	188.369	1393.189	9687.871	127.536	1148.2065	7.396
64	169.911	1223.278	8294.6823	116.323	1020.6704	7.200
65	152.7275	1070.5504	7071.4044	105.775	904.3479	7.010
66	137.1830	933.3674	6000.8540	96.0080	798.5733	6.804
67	122.7325	810.6349	5067.4866	86.8338	702.5653	6.605
68	109.5380	701.0969	4256.8517	78.3597	615.7315	6.401
69	97.4440	603.6529	3555.7548	70.4787	537.3718	6.195
70	86.3751	517.2778	2952.1019	63.1577	466.8931	5.989
71	76.2605	441.0173	2434.8241	56.3652	403.7355	5.783
72	67.1525	373.8648	1993.8268	50.1903	347.3702	5.567
73	58.8606	315.0042	1619.9420	44.4812	297.1799	5.351
74	51.3817	263.6225	1304.9378	39.2662	252.6987	5.131
75	44.6550	218.9675	1041.3153	34.5157	213.4325	4.904
76	38.6234	180.3441	822.3478	30.2016	178.9169	4.669
77	33.2338	147.1103	642.0037	26.2975	148.7153	4.426
78	28.4362	118.6741	494.8934	22.7782	122.4178	4.173
79	24.1842	94.4899	376.2193	19.6198	99.6396	3.907
80	20.3473	74.1426	281.7294	16.71302	80.01985	3.644
81	16.9366	57.2060	207.5868	14.08494	63.30682	3.378
82	13.8785	43.3275	150.3808	11.67826	49.22189	3.122
83	11.1463	32.1812	107.0533	9.47986	37.54362	2.887
84	8.67791	23.50329	74.87207	7.44018	28.06377	2.708
85	6.63253	16.87076	51.36878	5.72855	20.62359	2.544
86	4.97165	11.89911	34.49802	4.32278	14.89504	2.393
87	3.65951	8.23960	22.59891	3.20185	10.57226	2.252
88	2.62114	5.60846	14.35931	2.31423	7.37041	2.132
89	1.88984	3.71862	8.75085	1.67413	5.05618	1.968
90	1.34821	2.370411	5.032226	1.205185	3.382050	1.758
91	0.95818	1.412236	2.661815	0.867006	2.176865	1.474
92	0.65034	0.761891	1.249579	0.596029	1.309859	1.172
93	0.41689	0.345003	0.487688	0.387585	0.713830	0.828
94	0.22548	0.119522	0.142686	0.212211	0.326246	0.530
95	0.09636	0.023163	0.023163	0.091762	0.114035	0.240
96	0.02316	0.000000	0.000000	0.022272	0.022272	0.000

TABLE III.—Five per Cent.

Age.	D.	N.	Annuity. a_x
20	3424.04	45633.46	13.327
21	3206.07	42427.39	13.233
22	3001.78	39425.61	13.134
23	2810.33	36615.28	13.029
24	2630.62	33984.66	12.919
25	2461.94	31522.72	12.804
26	2303.36	29219.36	12.686
27	2154.84	27064.52	12.560
28	2015.24	25049.28	12.430
29	1884.24	23164.99	12.293
30	1761.25	21403.74	12.153
31	1645.42	19758.32	12.008
32	1536.64	18221.68	11.858
33	1434.29	16787.39	11.704
34	1338.19	15449.20	11.545
35	1248.00	14201.20	11.379
36	1163.02	13038.18	11.210
37	1082.81	11955.37	11.041
38	1007.13	10948.24	10.870
39	935.754	10012.487	10.699
40	868.467	9144.020	10.529
41	804.530	8339.490	10.365
42	744.957	7594.533	10.194
43	688.494	6906.039	10.030
44	635.375	6270.664	9.869
45	585.531	5685.133	9.709
46	538.781	5146.352	9.551
47	495.055	4651.297	9.395
48	454.079	4197.218	9.243
49	415.883	3781.335	9.092
50	380.383	3400.952	8.940
51	347.320	3053.632	8.792
52	316.623	2737.009	8.644
53	288.287	2448.722	8.493
54	262.004	2186.718	8.346
55	237.708	1949.010	8.199
56	215.456	1733.554	8.046
57	195.108	1538.446	7.885
58	176.006	1362.440	7.741
59	158.687	1203.753	7.585

TABLE III.—(Continued.)

Age.	D.	N.	Annuity. a_x
60	142.833	1060.920	7.427
61	128.383	932.537	7.262
62	115.132	817.405	7.099
63	103.082	714.323	6.929
64	92.096	622.227	6.756
65	82.073	540.154	6.581
66	72.947	467.207	6.404
67	64.641	402.566	6.228
68	57.143	345.423	6.045
69	50.349	295.074	5.861
70	44.205	250.869	5.675
71	38.656	212.213	5.489
72	33.716	178.497	5.294
73	29.2712	149.2258	5.098
74	25.3086	123.9172	4.896
75	21.7858	102.1314	4.688
76	18.6637	83.4677	4.472
77	15.9064	67.5613	4.247
78	13.4805	54.0808	4.011
79	11.3556	42.7252	3.762
80	9.4630	33.2622	3.515
81	7.80177	25.46043	3.263
82	6.33218	19.12825	3.020
83	5.03716	14.09109	2.797
84	3.88432	10.20677	2.627
85	2.94051	7.26626	2.471
86	2.18317	5.08309	2.328
87	1.59167	3.49142	2.193
88	1.13350	2.35792	2.080
89	0.80639	1.55153	1.924
90	0.56980	0.98173	1.723
91	0.40110	0.58063	1.447
92	0.26965	0.31098	1.153
93	0.17120	0.13978	0.816
94	0.09172	0.04806	0.524
95	0.03882	0.00924	0.238
96	0.00924	0.00000	0.000

TABLE IV.—*Six per Cent.*

Age.	D.	N.	Annuity. a_x
20	2832.75	33648.08	11.878
21	2627.40	31020.68	11.807
22	2436.77	28583.91	11.730
23	2259.83	26324.08	11.649
24	2095.37	24228.71	11.563
25	1942.51	22286.20	11.473
26	1800.24	20485.96	11.380
27	1668.28	18817.68	11.280
28	1540.48	17277.20	11.215
29	1431.42	15845.78	11.070
30	1325.33	14520.45	10.956
31	1226.49	13293.96	10.921
32	1134.597	12159.364	10.717
33	1049.032	11110.332	10.591
34	669.513	10140.814	10.460
35	895.644	9245.170	10.322
36	826.782	8418.388	10.182
37	762.498	7655.890	10.040
38	702.515	6953.375	9.898
39	646.570	6306.805	9.756
40	594.416	5712.389	9.610
41	545.637	5166.752	9.469
42	500.301	4666.451	9.327
43	458.024	4208.427	9.188
44	418.698	3789.729	9.051
45	382.213	3407.516	8.915
46	348.378	3059.138	8.781
47	317.084	2742.154	8.648
48	288.095	2453.959	8.518
49	261.372	2192.587	8.389
50	236.806	1955.781	8.259
51	214.183	1741.598	8.131
52	193.411	1548.187	8.004
53	174.441	1373.746	7.875
54	157.041	1216.705	7.747
55	141.1341	1075.5709	7.621
56	126.7158	948.8551	7.488
57	113.5498	835.3053	7.356
58	101.5704	733.7349	7.224
59	90.7120	643.0229	7.089

TABLE IV.—(Continued.)

Age.	D.	N.	Annuity. a_x
60	80.8787	562.1442	6.950
61	72.0108	490.1334	6.806
62	63.9687	426.1647	6.662
63	56.7336	369.4311	6.512
64	50.2087	319.2224	6.358
65	44.3086	274.9138	6.204
66	39.0224	235.8914	6.045
67	34.2532	201.6382	5.887
68	29.9939	171.6443	5.723
69	26.1789	145.4654	5.557
70	22.7673	122.6981	5.389
71	19.7219	102.9762	5.222
72	17.0369	85.93736	5.047
73	14.65313	71.28423	4.865
74	12.54994	58.73429	4.680
75	10.70115	48.03314	4.489
76	9.08111	38.95203	4.289
77	7.66647	31.28556	4.081
78	6.43599	24.84957	3.861
79	5.37033	19.47924	3.627
80	4.43300	15.04624	3.394
81	3.62036	11.42588	3.156
82	2.91068	8.51520	2.296
83	2.29356	6.22164	2.713
84	1.75196	4.46968	2.551
85	1.31376	3.15592	2.402
86	0.96619	2.18973	2.266
87	0.69777	1.49196	2.138
88	0.49222	0.99974	2.031
89	0.34687	0.65287	1.882
90	0.24279	0.41008	1.689
91	0.16930	0.24078	1.422
92	0.11274	0.12804	1.136
93	0.07091	0.05713	0.806
94	0.03763	0.01950	0.518
95	0.01578	0.00372	0.236
96	0.00372	0.00000	0.000

TABLE V.—Seven per Cent.

Age.	D.	N.	Annuity. a_x
20	2347.74	25108.99	10.695
21	2157.19	22951.80	10.640
22	1981.89	20967.91	10.581
23	1820.89	19149.02	10.511
24	1672.59	17476.43	10.449
25	1536.09	15940.34	10.377
26	1410.28	14530.06	10.303
27	1294.68	13235.38	10.223
28	1188.82	12046.56	10.133
29	1090.21	10956.35	10.050
30	999.967	9956.380	9.957
31	916.746	9039.634	9.860
32	840.135	8199.499	9.760
33	769.516	7429.983	9.655
34	704.542	6725.441	9.546
35	644.776	6080.665	9.431
36	589.639	5491.026	9.313
37	538.711	4952.315	9.193
38	491.692	4460.623	9.072
39	448.309	4012.314	8.950
40	408.295	3604.019	8.802
41	371.286	3232.733	8.707
42	337.256	2895.477	8.585
43	305.871	2589.606	8.466
44	276.996	2312.610	8.349
45	250.495	2062.115	8.232
46	226.186	1835.929	8.117
47	203.945	1631.984	8.002
48	183.568	1448.416	7.890
49	164.984	1283.432	7.779
50	148.280	1135.152	7.655
51	132.682	1002.470	7.555
52	118.694	883.776	7.437
53	106.0518	777.7241	7.333
54	94.5816	683.1425	7.223
55	84.2067	598.9358	7.113
56	74.8976	524.0382	6.997
57	66.4883	457.5499	6.882
58	58.9181	398.6318	6.766
59	52.1276	346.5042	6.647

TABLE V.—(Continued.)

Age.	D.	N.	Annuity. a_x
60	46.0425	300.4617	6.526
61	40.6112	259.8505	6.398
62	35.7386	224.1119	6.271
63	31.4002	192.7117	6.137
64	27.5391	165.1726	5.998
65	24.0671	141.1055	5.863
66	21.0077	120.0978	5.712
67	18.2591	101.8387	5.577
68	15.8392	85.9995	5.429
69	13.6954	72.3041	5.279
70	11.7993	60.5048	5.128
71	10.1256	50.3792	4.977
72	8.66624	41.71297	4.813
73	7.38317	34.32980	4.650
74	6.26436	28.06544	4.480
75	5.29160	22.77384	4.304
76	4.44854	18.32530	4.120
77	3.72046	14.60484	3.926
78	3.09413	11.51071	3.720
79	2.55768	8.95303	3.500
80	2.09156	6.86147	3.281
81	1.69215	5.16932	3.055
82	1.34774	3.82158	2.836
83	1.05207	2.769512	2.632
84	0.796119	1.973393	2.479
85	0.591415	1.381978	2.337
86	0.430886	0.951092	2.207
87	0.308272	0.642820	2.085
88	0.215430	0.427390	1.984
89	0.150396	0.276994	1.842
90	0.104283	0.172711	1.656
91	0.072037	0.100674	1.398
92	0.047523	0.053151	1.118
93	0.029609	0.023542	0.795
94	0.015566	0.007976	0.512
95	0.006465	0.001511	0.234
96	0.001511	0.000000	0.000

TABLE VI.—*Eight per Cent.*

Age.	D.	N.	Annuity. a_x
20	1949.170	18926.567	9.710
21	1774.393	17152.174	9.670
22	1615.182	15536.992	9.619
23	1470.162	14066.830	9.568
24	1337.921	12728.909	9.514
25	1217.351	11511.558	9.456
26	1107.302	10404.256	9.396
27	1007.128	9397.128	9.331
28	915.7185	8481.4097	9.262
29	832.4322	7648.9775	9.189
30	756.2602	6892.7173	9.114
31	687.0838	6205.6335	9.032
32	623.8348	5581.7987	8.948
33	566.1070	5015.6917	8.860
34	513.5085	4502.1832	8.767
35	465.5962	4036.5870	8.670
36	421.8392	3614.7478	8.569
37	381.8360	3232.9118	8.467
38	345.2835	2887.6283	8.363
39	311.9019	2575.7264	8.258
40	281.4331	2294.2933	8.152
41	253.5537	2040.7396	8.049
42	228.1815	1812.5581	7.943
43	205.0306	1607.5275	7.840
44	183.9560	1423.5715	7.739
45	164.8160	1258.7555	7.637
46	147.4441	1111.3114	7.537
47	131.7146	979.5968	7.438
48	117.4567	862.1401	7.340
49	104.5883	757.5518	7.243
50	93.0032	664.5486	7.145
51	82.5606	581.9880	7.049
52	73.1729	508.8151	6.954
53	64.7738	444.0413	6.855
54	57.2332	386.8081	6.758
55	50.4833	336.3248	6.662
56	44.4866	291.8382	6.560
57	39.1261	252.7121	6.459
58	34.3503	218.3618	6.357
59	30.1099	188.2519	6.252

TABLE VI.—(Continued.)

Age.	D.	N.	Annuity. a_x
60	26.3488	161.9031	6.145
61	23.0254	138.8777	6.031
62	20.0752	118.8025	5.918
63	17.4748	101.3377	5.799
64	15.1787	86.1490	5.676
65	13.1370	73.0120	5.558
66	11.3640	61.6480	5.426
67	9.79043	51.85758	5.297
68	8.41427	43.44331	5.163
69	7.20803	36.23528	5.027
70	6.15261	30.08267	4.889
71	5.24095	24.84172	4.740
72	4.43559	20.40613	4.601
73	3.74390	16.66223	4.451
74	3.14515	13.51708	4.298
75	2.63383	10.89325	5.132
76	2.19371	8.68954	3.961
77	1.81768	6.87186	3.781
78	1.49768	5.37418	3.588
79	1.22656	4.14762	3.382
80	0.993741	3.153880	3.174
81	0.796531	2.357349	2.960
82	0.628533	1.728816	2.751
83	0.486101	1.242715	2.557
84	0.364437	0.878278	2.410
85	0.278221	0.610057	2.275
86	0.193608	0.416449	2.151
87	0.137232	0.2792173	2.035
88	0.0950143	0.1842030	1.939
89	0.0657170	0.1184860	1.803
90	0.0451462	0.0733398	1.625
91	0.0308972	0.0424426	1.374
92	0.0201941	0.0222485	1.102
93	0.0124656	0.0097829	0.785
94	0.0064924	0.0032905	0.507
95	0.0026718	0.0006187	0.232
96	0.0006187	0.0000000	0.000

TABLE VII.—*Annual Premia for Assurances.
Four per Cent.*

Age.	One Year.	Two Years.	Three Years.	Four Years.	Five Years.	Six Years.	Seven Years.	Whole Life.
20	.01620	.01621	.01623	.01628	.01639	.01646	.01654	.02356
21	.01626	.01629	.01637	.01642	.01648	.01659	.01669	.02405
22	.01633	.01642	.01646	.01662	.01666	.01677	.01685	.02457
23	.01648	.01657	.01663	.01676	.01689	.01696	.01707	.02513
24	.01665	.01681	.01693	.01698	.01709	.01720	.01732	.02372
25	.01697	.01700	.01709	.01718	.01728	.01746	.01761	.02633
26	.01702	.01717	.01728	.01741	.01757	.01773	.01790	.02698
27	.01733	.01743	.01756	.01773	.01790	.01808	.01826	.02768
28	.01753	.01768	.01788	.01806	.01826	.01845	.01863	.02841
29	.01785	.01808	.01826	.01847	.01867	.01891	.01907	.02920
30	.01832	.01849	.01870	.01890	.01909	.01932	.01958	.03002
31	.01867	.01892	.01912	.01932	.01955	.01984	.02023	.03088
32	.01917	.01936	.01955	.01981	.02012	.02045	.02081	.03179
33	.01955	.01981	.02005	.02039	.02076	.02115	.02154	.03274
34	.01992	.02031	.02070	.02111	.02152	.02195	.02242	.03375
35	.02067	.02110	.02153	.02197	.02242	.02292	.02340	.03466
36	.02156	.02201	.02247	.02293	.02346	.02396	.02448	.03594
37	.02249	.02297	.02345	.02402	.02454	.02508	.02563	.03708
38	.02348	.02398	.02460	.02514	.02571	.02629	.02684	.03830
39	.02452	.02521	.02577	.02637	.02697	.02755	.02812	.03953
40	.02595	.02643	.02706	.02769	.02828	.02887	.02944	.04080
41	.02705	.02769	.02834	.02897	.02959	.03018	.03078	.04207
42	.02844	.02910	.02973	.03036	.03096	.03158	.03218	.04339
43	.02982	.03044	.03109	.03171	.03236	.03298	.03356	.04473
44	.03139	.03180	.03244	.03312	.03376	.03435	.03495	.04608
45	.03253	.03317	.03389	.03455	.03515	.03577	.03637	.04756
46	.03386	.03465	.03532	.03594	.03658	.03720	.03744	.04887
47	.03549	.03614	.03675	.03740	.03808	.03861	.03920	.05031
48	.03685	.03745	.03814	.03880	.03939	.04001	.04061	.05175
49	.03811	.03886	.03957	.04016	.04080	.04144	.04198	.05323
50	.03968	.04039	.04097	.04163	.04228	.04284	.04342	.05475
51	.04116	.04169	.04239	.04308	.04364	.04425	.04485	.05630
52	.04228	.04309	.04384	.04441	.04504	.04567	.04627	.05788
53	.04397	.04473	.04525	.04589	.04655	.04717	.04777	.05955
54	.04555	.04597	.04665	.04734	.04799	.04862	.04920	.06125
55	.04644	.04728	.04806	.04875	.04942	.05002	.05067	.06300
56	.04814	.04898	.04968	.05035	.05096	.05163	.05226	.06485
57	.04983	.05052	.05121	.05182	.05253	.05324	.05385	.06677
58	.05127	.05194	.05262	.05338	.05406	.05476	.05552	.06875
59	.05280	.05340	.05422	.05494	.05569	.05651	.05727	.07086
60	.05406	.05505	.05581	.05661	.05736	.05835	.05919	.07308

PROCEEDINGS
OF THE
ASIATIC SOCIETY OF BENGAL

FOR MARCH, 1850.

The usual monthly meeting of the Asiatic Society was held on the evening of the 6th March.

J. R. COLVIN, Esq. Member of the Council, in the chair.

The proceedings of the last meeting were read and confirmed.

Notes were recorded from Mr. Brandreth, Captain Baseley, Major Hannay and Capt. Staples withdrawing from the Society.

The following gentlemen were named as candidates for election at the April meeting.

C. T. Watkins, Esq.,—proposed by Mr. Heatly, and seconded by Mr. Blyth. ●

A. J. M. Mills, Esq. B. C. S.,—proposed by J. R. Colvin, Esq., and seconded by Dr. W. B. O'Shaughnessy.

T. Morton, Esq. Madras Medical Service,—proposed by J. R. Colvin, Esq., and seconded by Dr. W. B. O'Shaughnessy.

Hon'ble Capt. R. B. Byng,—proposed by Dr. O'Shaughnessy, and seconded by J. R. Colvin, Esq.

The Rev. Principal Kay of Bishop's College,—proposed by Rev. S. Slater, and seconded by F. E. Hall, Esq.

Letters were read:—

1. From the Secretary to Government, Home Department, forwarding a plan of the city of Jagannath.

2. From Mr. Bowring, C. S. submitting a description of the Shekim district.

3. From H. Torrens, Esq. forwarding a plan and drawing of the Adinā Masjid.

It being stated that this monument is rapidly falling to ruin, it was agreed unanimously that the Society make a representation to Government, soliciting that measures be taken for its repairs and its preservation.

4. From Dr. Wise, forwarding a Bengali history of Tipperah. Referred to the Oriental Section. (And since the meeting, at Dr. Wise's request, made over for examination to Mr. Jones.)

5. From Mr. Laidlay, forwarding a series of maps, illustrative of his version of a Chinese treatise on the river courses of the countries West of China Proper.

6. From Mr. Laidlay, tendering his resignation of the office of Joint Secretary.

On the proposition of the Honorable President and the Council, the Society unanimously decided to place on record, "their grateful sense of the valuable services Mr. Laidlay has rendered to the Society, and of the happy combination of zeal, ability learning, and temper with which he has so long discharged the functions of Joint Secretary and Editor of the Journal."

It was further and unanimously voted that Mr. Laidlay's resignation be not accepted, and that he continue, during his absence, to be Joint Secretary to the Society.

Read again the resolution respecting Col. Forbes' retirement from the list of Vice-Presidents, proposed by Mr. Colvin, and seconded by Capt. Broome, at the January meeting—

"That as a testimony of the great respect and esteem of the Society Col. Forbes be elected an Honorary Vice-President of the Society (on the occasion of his retirement from the list of active Vice-Presidents) as was done on the retirement of Mr. H. Torrens."

Unanimously carried.

Read a letter from the Statistical Section communicating their desire to apply to Government for permission to consult certain records—also

a memorandum of the approval of the Council of the proposition submitted by the Section.

SIR,—We have the honour to request that you will be pleased to lay before the Society, with a view to its being forwarded, if approved of, the undermentioned suggestions of the Section appointed by the Society for the advancement of Statistical Science in India.

At a meeting of the Section the various means of obtaining Statistical Information were attentively considered, and it was proposed by Captain Staples and resolved unanimously that, as the resources at the command of the Section are very limited, and as the records in the office of the Government of Bengal are considerable, the Secretary of the Society be requested with sanction of the Society, to solicit Government to permit the Index of the papers now in the Bengal Secretariat Office, to be copied or published by the Society, and subsequently to permit such papers as the Society may consider valuable, and the Government may please to authorize, to be published or extracts taken from them; and secondly that the members of the Section or other properly authorized persons, be permitted access to the records or such portion of them, as the Government may be pleased to place at their disposal for the above purpose.

We have the honor to be, Sir,

Your most obedient servants,

N. A. STAPLES, *Br. Captain, Artillery.*

JAMES LONG, C. L. K.

March 27th, 1850.

S. G. T. HEATLY.

Unanimously adopted.

Mr. Piddington brought forward a resolution respecting lending of Books and MSS. and copying of MS.

The Librarian having submitted his usual monthly report, the meeting adjourned.

Confirmed, J. W. COLVILLE, President.

W. B. O'SHAUGHNESSY, *V. P. and Secy.*

3rd April, 1850.

LIBRARY.

The following books have been received since the last meeting.

Presented.

Elements of Electro-Biology, or the Voltaic Mechanism of man; of Electro-Pathology, especially of the Nervous System; and of Electro-Therapeutics. By Dr. Alfred Smee.—PRESENTED BY THE AUTHOR.

The Report of the British Association for the advancement of Science, for 1848.—BY THE ASSOCIATION.

Bulletin de la Société de Géographie, 3me, serie, Tome X.—BY THE SOCIETY.

An Apology for the Present System of Hindu Worship, Calcutta, 1817. 8vo.—BY H. PIDDINGTON, Esq.

The Loghu Kaumudī, a Sanskrita Grammar, with an English Version. Part. I. BY DR. J. BALLANTINE.

Indische Alterthumskunde. Von C. Lassen. Zweiter Band. Geschichte von Buddha bis auf die Gupta-Könige. Bonn, 1849, 8vo.—BY THE AUTHOR.

Verhandelingen van het Bataviaasch Genootschap van Kunsten en Wetenschappen. Deel XXII.—BY THE BATAVIAN SOCIETY OF ARTS AND SCIENCES.

Œuvres de La Place. Tome VII. Theorie Analytique des Probabilités, Paris, 1847, 4to.—BY THE EDITOR.

The White Yajus Veda, edited by Albrecht Weber. Part II. The Satapatha Brāhmaṇa in the Mādhyandinī Śākhā, with extracts from the Commentaries of Śāyana, Harisvāmin and Dvivedaganga, Berlin, 1849.—BY THE EDITOR.

Druckfehler, Berichtigungen und Nachträge zum ersten Bande.—BY THE EDITOR.

Barometrographia: Twenty years variation of the Barometer in the Climate of Britain, exhibited in autographic curves with the attendant winds and weathers, and copious notes illustrative of the subject. By Luke Howard, Esq. London, 1847, Rl. folio.—BY THE AUTHOR.

Zeitschrift der Deutschen morgenlandischen Gesellschaft, herausgegeben von den Geschäften führen. Drittes Band, II. und III. Heft.—BY THE EDITORS.

Journal of the Royal Geographical Society of London, Vol. XIX. part I.—BY THE SOCIETY.

Transactions of the Royal Society of London for the year 1847.—BY THE SOCIETY.

Proceedings of the Royal Society of London, Nos. 68-72.—BY THE SAME.

List of the Fellows of the Royal Society, 1847.—BY THE SAME.

Address of the most noble the Marquis of Northampton, the President, read at the General Meeting of the Royal Society on Tuesday, June 9th 1848.—BY THE SAME.

Journal of the Indian Archipelago for January, 1850.—BY THE EDITOR.

Ditto ditto, 2 copies.—BY THE GOVERNMENT OF BENGAL.

Upadeshaka, No. 39.—BY THE EDITOR.

The Oriental Baptist, No. 39.—BY THE EDITOR.

The Calcutta Christian Observer for March, 1850.—BY THE EDITORS.

Meteorological Register kept at the Surveyor General's Office, Calcutta, for the month of January, 1850.—BY THE DEPUTY SURVEYOR GENERAL.

Tattvabodhiní Patriká, Nos. 78-9.

Purnachandrodaya, for February, 1850.—BY THE EDITOR.

Exchanged.

Journal Asiatique, Nos. 61-4.

Journal of the Royal Asiatic Society, Vol. XI. Part I. and Vol. XII. Part I.

Quarterly Journal of the Geological Society, Nos. 18-19.

Jameson's Journal, No. 93.

Purchased.

Comptes Rendus, Nos. 16 @ 21.

Histoire Naturelle des Poissons, Tome XXII.

Haji Khalfæ Lexicon Bibliographicum et Encyclopaedicum, Vol. V.

The Annals and Magazine of Natural History, for December, 1849. •

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Meteorological Register kept at the Surveyor General's Office, Calcutta, for the Month of March, 1850.

Observations made at Sun-rise.										Observations made at apparent noon.											
Date.	Temperature.					Wind.	Aspect of Sky.	Maximum Pressure observed at 9h. 50m.					Wind.	Aspect of Sky.	Observations made at apparent noon.						
	Bar. 32° F. red. to	Of Mer.	Of Air.	W. Bulb.	Inches			Bar. 32° F. red. to	Of Mer.	Of Air.	W. Bulb.	Inches			Bar. 32° F. red. to	Of Mer.	Of Air.	W. Bulb.	Inches		
1	29.981	65.2	65.8	65.0	30.034	S. E.	Clear	76.8	77.4	72.6	S. W.	Cumuli	83.3	83.8	72.0	29.983	83.3	83.8	72.0	W. S. W.	Clear
2	29.966	70.7	71.2	70.4	.090	S. S. W.	Ditto	79.2	80.0	68.2	S. S. W.	Clear	85.8	86.0	68.0	29.975	85.8	86.0	68.0	W. S. W.	Ditto
3	29.943	85.2	85.2	81.6	29.943	S. S. W.	Ditto	81.6	82.3	70.3	S. W. sp.	Ditto	89.0	90.7	70.8	29.980	89.0	90.7	70.8	S. sharp.	Ditto
4	29.970	68.7	68.5	61.0	.920	S. W.	Ditto	81.5	82.3	66.2	W. N. W.	Ditto	86.7	89.0	67.0	29.977	86.7	89.0	67.0	W. N. W.	Ditto
5	29.903	68.0	64.8	60.0	.970	W.	Ditto	82.2	83.0	63.2	W. N. W.	Ditto	89.5	87.0	62.9	29.925	89.5	87.0	62.9	W. sharp.	Ditto
6	29.866	66.4	66.8	66.0	.933	W.	Ditto	80.0	81.0	68.5	N. W.	Ditto	88.2	88.7	66.0	29.882	88.2	88.7	66.0	W. S. W.	Ditto
7	29.889	67.1	67.2	65.2	.963	N.	Ditto	81.0	83.0	73.2	E. S. E.	Ditto	91.2	90.9	69.2	29.912	90.9	90.9	69.2	W. S. W.	Ditto
8	29.883	67.1	67.2	62.9	.928	S. W.	Ditto	81.0	82.8	68.6	S. W.	Ditto	87.7	92.0	68.2	29.877	92.0	92.5	68.2	W.	Ditto
9	29.817	71.8	72.2	71.7	.867	S. W. Foggy	Ditto	80.0	80.7	74.0	S. W.	Ditto	89.4	90.1	70.2	29.824	90.1	89.9	70.2	W.	Ditto
10	29.735	69.3	69.8	64.3	.802	W. N. W.	Ditto	85.0	85.4	67.0	W. N. W.	Ditto	90.3	89.8	65.8	29.764	90.3	89.8	65.8	ws. w. sp.	Ditto
11	74.2	75.0	75.0	73.0	.828	Cloudy	.....	81.6	81.3	75.8	S. S. W.	Clear	89.2	88.7	76.0	74.5	89.2	88.7	76.0	S. S. W.	Clear
12	79.4	76.0	74.0	74.0	.794	W.	Ditto	83.7	82.8	75.5	S. S. E.	Cirro-cumuli	89.3	89.2	76.3	78.0	89.3	89.2	76.3	S.	Cirro-cumuli
13	77.0	71.8	72.2	71.2	.832	S. E.	Ditto	82.9	83.0	77.7	S. S. W.	Cumuli-strati	87.6	87.4	77.5	79.0	87.6	87.4	77.5	N. W.	Cumuli
14	77.1	75.0	75.5	74.2	.857	S. E.	Ditto	83.8	83.8	77.0	S. W.	Cumuli	88.2	88.0	78.0	89.2	88.2	88.0	78.0	S. S. W.	Ditto
15	81.6	69.4	69.7	68.2	.915	E. S. E.	Cirro-cumuli	79.3	80.0	74.8	N.	Ditto	86.3	85.3	76.7	89.3	86.3	85.3	76.7	S. S. E.	Ditto
16	85.8	69.4	69.7	68.2	.905	N. E.	Cloudy	71.5	71.5	68.3	N.	Cloudy	88.3	88.3	76.7	30.019	88.3	88.3	76.7	N. E.	Rain & thundg.
17	97.4	67.3	67.8	65.5	.971	E. N. E.	Cumuli	77.6	75.9	70.2	N. E.	Clear	82.0	82.0	70.3	30.019	82.0	82.0	70.3	N. W.	Clear
18	90.0	66.3	66.5	65.5	.905	N. E.	Foggy	80.5	80.2	75.2	E.	Cumuli	87.0	87.0	71.2	.021	87.0	87.0	71.2	S.	Cumuli
19	93.7	68.8	69.2	68.0	.921	S.	Clear	81.4	81.4	74.4	S. W.	Ditto	86.3	86.2	74.7	29.979	86.3	86.2	74.7	S. W.	Ditto
20	97.4	69.6	70.3	69.0	.965	S. W.	Ditto	83.0	83.0	76.0	S. W.	Clear	89.7	89.7	77.0	29.909	89.7	89.7	77.0	W.	Clear
21	90.1	72.0	72.4	71.3	.917	W. N. W.	.....	82.8	82.5	75.5	W. S. W.	Ditto	93.0	92.2	68.5	29.945	93.0	92.2	68.5	N. W.	Ditto
22	93.2	69.8	70.3	66.0	.923	W. N. W.	Ditto	83.1	86.9	71.9	N. N. W.	Ditto	93.0	92.2	68.5	29.945	93.0	92.2	68.5	N. W.	Ditto
23	95.2	69.3	69.7	65.7	.938	N. W.	Ditto	89.2	88.8	69.0	S. W.	Ditto	93.7	92.8	66.8	30.025	93.7	92.8	66.8	S. S. W.	Ditto
24	90.0	69.3	69.7	65.7	.938	N. W.	Ditto	89.2	88.8	69.0	S. W.	Ditto	93.7	92.8	66.8	30.025	93.7	92.8	66.8	S. S. W.	Ditto
25	95.7	72.0	72.8	70.7	.963	S. W.	Cirro-strati	84.5	84.4	73.0	W.	Ditto	92.3	90.8	71.5	.025	92.3	90.8	71.5	S. W.	Clear
26	98.5	71.8	72.0	70.3	.947	S. W.	Clear	85.8	85.0	74.0	S. W.	Ditto	92.7	92.3	74.2	.009	92.7	92.3	74.2	S. W.	Clear
27	98.7	72.2	72.9	70.2	.945	S. W.	Ditto	85.8	85.6	74.2	S. W.	Ditto	92.3	92.3	72.1	29.994	92.3	92.3	72.1	S. W.	Ditto
28	93.9	72.9	73.0	71.3	.937	N. E.	Ditto	85.8	85.9	74.0	S. W.	Ditto	93.8	94.0	78.3	.921	93.8	94.0	78.3	S. W.	Ditto
29	86.3	76.2	77.0	75.0	.897	N. E.	.....	87.0	85.3	75.3	N. W.	Ditto	91.6	90.6	74.2	.864	91.6	90.6	74.2	N. N. W.	Cirro-cumuli
30	87.4	75.6	75.8	73.0	.917	S. E.	Clear	89.0	87.5	68.3	N. N. W.	Ditto	92.3	91.8	69.2	.862	92.3	91.8	69.2	N. N. W.	Clear
31	29.908	70.4	70.8	68.5	.924	82.4	82.5	73.8	88.6	88.3	69.2	29.915	88.6	88.3	69.2

JOURNAL

OF THE

ASIATIC SOCIETY.

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No. IV.—1850.  
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*Extracts from DR. VOYSEY'S Private Journal, when attached to the
Trigonometrical Survey in Southern and Central India, No. III.*

Saturday, 20th February, 1819.—I passed through the village of Mengoor near which, on the banks of a small nullah, the thermometer sank to 47° just before sunrise : in its neighbourhood, I also saw a bed of lithomarge lying on the alluvium which rested as usual on the trap. The fields on my right and left were full of gram and corn crops ; nevertheless I observed that a large quantity of land had been thrown out of cultivation. The approach to the Godavery was over waving land consisting entirely of trap and alluvium ; now and then beds of amygdaloid with green earth and wacké were seen, and within a mile of the river small blocks of granite rising through the alluvium, so rounded, that I found it impossible to bring away specimens. My visit to the rocks was first paid ; I found them to consist of granite forming the banks and bed of the river, the former were about 40 feet high ; of this height the granite occupied one-half and the remainder consisted of black cotton soil ; the river was shallow indeed. I crossed its deepest part, and found it vary from 2 to 4 feet in depth, its bed consisting of granitic sand mixed with a few calcedonies and agates, and on the borders magnetic iron sand ; I did not see shells. In the crevices of the rocks I found some pieces of stilbite or radiated zeolite. The height to which the river rose two years ago, was pointed out to me, it might be about 30 feet above its present level : it had washed away the corner of a wall surrounding a handsome pagoda built of black basalt :

it must now no doubt have changed its bed materially, since tradition places the pagoda many years ago, far from its banks. The temperature of the river at 12 o'clock was 74° , the same with the air. The basalt of which the pagoda is built is in some parts of the building finely polished. It contains olivine. The granite much resembles that found near Bachapilly at the Bear's rock. It is porphyritic containing large crystals of red felspar in a crystalline cement composed of quartz, compact felspar and mica. This is the prevalent rock. A porphyritic greenstone lies near it, apparently in beds, in which the crystalline felspar is compact and of a green colour arising from green hornblende? I believe them to be the same with those of the Bear's rock at Bachapilly. The distance from Thevalingapate hill is 12 miles and the sole rock is the trap, sometimes basaltic, sometimes wacké on the elevations, and in the plains black cotton soil.

Monday, 22nd February, 1819.—On quitting this place the thermometer stood at 47° and the temperature of water at $5\frac{1}{2}$ o'clock A. M. was 43° ; a march of 7 miles brought us to Monegal: nothing but trap of which I am heartily tired.

Tuesday, 23rd February, 1819.—The formations in this part of India differ materially from those of Europe; no chalk, no intermediate rocks between the trap and granite. The whole field of view, probably an extent of 20 miles. The ravines of the formation are much deeper than usual.

Sunday, 27th February, 1819.—Large beds of wacké began now to appear, generally lower, or at the bottom of the more elevated trap hills. On arriving near, a temple with a basaltic column similar to one I had seen on the banks of the Godavery struck me, and I made an attempt to draw it.

Monday, 28th February, 1819.—The river bed differed very little from that of the Mulinar. I followed it until I came to the same or a similar appearance, which had before struck me: large masses of red granite imbedded in a coarse cement of limestone, containing crystals of felspar quartz, &c. I drew a sketch of the banks which bore a great resemblance to those of the Mulinar and Manjera. We arrived at Buhtalipoor. In the evening I visited the formation of wacké, to ascertain a fact mentioned in Thomson's Annals, confirmed. It was not calcedony in wacké.

Tuesday, 1st March, 1819.—The configuration of the hills was

very striking, with the same form I have before noticed, fewer peaks, and lying at right angles to each other in many instances. Once or twice I observed a complete quadrangle all but one side, the opening being towards the plain.

Wednesday, 2nd March, 1819.—A rugged road from the frequent ascent and descent of the trap hills. On one of them I observed a vein of quartzose rock passing into flint running E. and W. I crossed the Scinde; the bed consisting entirely of black trap or basalt, very compact. At Dapky I lowered the temperature of Fahrenheit from 92° to 62° at sunset. I noticed a bed of lithomarge on my road.

Thursday, 3rd March, 1819.—The hill on which the flag is fixed about four miles and a half from Oudeghir, is covered with calcedony amorphous, cellular with impressed crystals, and striped mammillary onyx, some imbedded in the cavities of the basalt; amongst them I found one piece of green amorphous calcedony. Five hundred yards from the tent, I saw on the side of a hill, exposed by a slip, imperfect columns of basalt resembling precisely the description in Thomson's Annals; the Rowley Rag basalt. Oudeghir (the fort) stands on one of the flat hills so frequently mentioned surrounded on every side by the semi-columnar basalt.

Friday, 4th March, 1819.—I rode through the town of Oudeghir, which is entirely built of basalt. It is the largest native town I have seen, some of the streets wide and the houses neat. My sketch of the hills to the northward of the fort, when seated on a neighbouring hill on a level with it, is the best I could take; it ill represents the singular rise one above the other of the basalt: the hills representing to the eye an appearance of distinct strata, which reminds me of the Isle of France; beds of carbonate of lime are very frequent. I noticed on my way semi-columnar basalt in a large deposit to the left of the town.

Saturday, 5th March, 1819.—In the evening I rode to the right of the town and came to something very much resembling the iron clay, not very dissimilar to that of the Cape of G. Hope.

Sunday, 6th March, 1819.—In the evening I rode to the basalt; I found one column, of 8 sides, more than a metre in diameter, the interstices were filled with green earth and sometimes with the globular wacké. In some of the columns I noticed depressions and elevations for the reception of a corresponding piece as in the Giant's Causeway and Staffa.

To the westward and southward all the hills have the same appearance, and I have no doubt that they are the same formation.

Monday, 7th March, 1819.—I wandered over some hills to the left of Oudeghir, where I found trap tuff, wacké and carbonate of lime (tuffaceous) in abundance, containing crystals of zeolite apparently of fresh formation. At the bottom semi-columnar basalt very black and of great specific gravity; on the right of the town, there are very extensive ruins of houses and other buildings. The stream which struggles through the valley is fed by the infiltration from the hills. We passed on our road to Doongong, over many pavements of basalt, some of them semi-columnar with the interstices filled up by a secondary formation or injection of basalt; we saw also two remarkable elevations nearly north and south. In the neighbourhood of Doongong, vast quantities of wacké and basalt and trap tuff, alternating frequently and without order.

Wednesday, 9th March, 1819.—The land is waving as usual with a few abrupt acclivities from two to three hundred feet in height. The trap appears less subject to decomposition, having a very thin coat of soil, and in many parts, it was found impossible to drive in the tent pegs.

Thursday, 17th March, 1819.—I found on the road the basaltic trap as usual, and in the neighbourhood of a ruined building some of the iron clay in lumps, apparently brought from some distance.

Saturday, 19th March, 1819.—Reached Dammergidda at sunrise and proceeded to the Manjera, which I crossed and encamped at Chillelah in sight of Beder, distant about 5 coss seated on a hill. The left bank is of the black alluvium, about fifteen or twenty feet high, sometimes much less: the right bank rises to upwards of 60 feet in height, forming a hill of considerable size on which Chillelah is seated; the bank is composed of large masses of an earthy and crystalline brown limestone very much waterworn and containing large cavities which appear to have been formerly filled by pieces of wacké, in some places containing large masses of flint, and in others forming a compound rock being a cement to a rocky compound of wacké basalt, clay and flint. Near the upper part it has the appearance of regular stratification, and on its top wacké easily decomposable is spread over it. I have yet to observe it more closely. The carbonate of lime contains a small portion of alluvium.

Sunday, 20th March, 1819.—I bathed twice and collected on the bank of the river a large quantity of the iron sand, which I suppose to contain iron ore, very little of it being taken up by the magnet. I also found very fine clay. I took a ride in the evening and a sketch of the hills near Beder.

Monday, 21st March, 1819.—I took a more accurate survey of the banks of the Manjera in the neighbourhood of Chillerjee. The confusion or mixture of the two rocks is much greater than I at first imagined. I noticed close to the present level of the river, a rock of compact basalt which at the distance of three or four feet becomes wacké, passing into the admixture of carbonate of lime and lumps of wacké, and that again into the porous limestone containing clay, and green earth, presenting externally large cavities out of which those substances have been washed; above the limestone is a brownish wacké on which the town is built; the height of the whole is about 40 or 50 feet: the banks below and above were composed of the black alluvium, but I was told the limestone was found in considerable quantity both above and below. The height of the river was rather distinctly marked during the rainy season, by the impression it had made on the foundations of a mosque built on its bank.

Tuesday, 22nd March, 1819.—A short distance from the hill on which Beder stands, the soil gradually changes from black to a reddish tinge from the decomposition of the iron clay of the range of which and on which Beder is built. This is the greatest elevation of the iron clay that I have seen in India, the barometer indicating 2000 feet above the level of the sea. In some places particularly in those excavations near the fort, it resembles very much the iron clay of Nellore containing in its vesicles Lithomarge, and the wells are generally very deep, one measured 40 cubits; the temperature of the water was 78°. The iron clay contains lithomarge as usual and it approaches a plumb blue colour. I ascended the tower on which the flag was, and could not avoid noticing the flatness of the isolated mountains which had before struck me in so many instances.

Wednesday, 23rd March, 1819.—I noticed greenstone, granite, and basalt in different parts of the building, which was chiefly composed of the iron clay and bricks.

Friday, 25th March, 1819.—I rode this morning down the hill into

the plain to the northward, the iron clay presented in no instance an appearance of stratification, but I noticed in several instances a gradual transition from it into wacké and thence into basalt, of which there are numerous little elevations in the neighbourhood. I noticed also lithomarge in considerable quantities, both in beds and in the rock itself, I re-ascended to the southward, finding the iron clay vary in form and in some instances degenerating into an ochery soft clay. It must be observed that the iron clay itself is very soft when first quarried and becomes indurated on exposure to the air. To the south-east a curious sight presented itself in the form and disposition of the hills, of which I made a sketch taken in a different direction; the flattened summits were here most distinctly seen with the bevelments of the usual angle; around these were several small conical summits entirely isolated, some on the contrary were of a flattened rounded form, intermixed, consisting evidently of basalt.

Saturday, 26th March, 1819.—I recommenced my observations on the hill of Beder, and this morning rode to the north-westward. I every where saw the basalt at the foot of the hill passing into wacké and iron clay, in one place the transition did not occupy more than three feet and was very distinct. This easily explains the depth of the wells in the fort and the tower; the very porous iron clay being unable to hold the water it drips through until it meets with the basalt. It is proper here to observe that in most instances the vesicles or pores of the rock, had the appearance of long hollow tubes always vertical. The basalt was not confined to the valley but was found in a considerable number of elevations, of all forms, around. I observed on the western side several springs just above the level of the basalt. The singular improvidence and want of foresight in the builders of the fort was very evident in several places: finding the rock so very soft and easily worked they excavated, or rather cut it down even with the wall, it has subsequently moldered and the wall has been precipitated with it. The high land projecting into the valley or plain through which the Manjera runs, like a number of buttresses resembling very much that at Sudghir, is seen to the westward; to the verge of the horizon to the eastward the hills have a more abrupt and irregular character. The magnetic needle did not appear to be affected by the iron clay rocks. I visited a manufactory of Beder bôt.

toms ; the basis pewter, the design whether of flowers or other pattern is chiselled out of the black ground, by an instrument fitted for the purpose, a paper is pressed strongly over it which takes the sharp edges of the design, and this paper is placed on a thin sheet of *silver** for the purpose of cutting it into the requisite forms ; these are then inlaid and the edges of the pewter pressed down, so as to enclose the silver completely.

Sunday, 27th March, 1819.—Temperature of two springs on the N. W. side of Beder 76°, of neighbouring water 73°. I again examined the passage of the basalt into the iron clay. In some places the passage from the almost columnar basalt into nodular, and then into the iron clay is very distinct, on the other hand in other places the basalt appears to pass under it and in some instances forms a causeway in the path, at the side of which rises the iron clay.

Monday, 28th March, 1819.—I ascended the minaret and had a fine view of the country, the whole to the southward, eastward and westward had the appearance of a vast elevated plain ; to the north it terminates in the projecting buttresses of iron clay into the valley through which the Mayna runs and which is ten miles in breadth.

Tuesday, 29th March, 1819.—From Beder we began immediately to descend to that ground which appeared from the minaret to be an extensive plain ; consisting of numerous elevations and depressions, or a collection of several plains intersected by deep ravines. The whole consisted of iron clay, but on our road to Shelapilly four zones of the black cotton soil intersected our path running due north and south ; the difference was strongly marked. The iron clay soil was almost incapable of cultivation, and the other presenting its usual appearance of fertility. We are at present encamped on one of these zones, having a direction nearly north and south : at the foot of a conical elevation of 40 feet, composed entirely of earth from the top, the iron clay is seen on each side at the distance of $\frac{1}{4}$ of a furlong. Query, is this hill the focus whence this muddy eruption has issued ? One more is visible in the plain about 2 miles distance. The earth at the depth of two or three feet is sufficiently moist to allow it to be made into a ball with the hands. Temperature 5° below the atmosphere.

* Copper and silver nearly equal parts.

Wednesday, 30th March, 1819.—I visited the small hill I have before mentioned, and found reason to suppose it artificial. The black soil was in some places intermixed with the trap clay, and in others was in indistinct zones, all with N. or N. by W. direction.

Thursday, 31st March, 1819.—We descended from the iron clay during the night, and in the morning found ourselves on the black soil in a level plain. I found considerable quantities of carbonate of lime intermixed with the wacké which is here found in the same nodular masses with a hard kernel which I have before noticed at Banktapoo. The soil contained a large quantity of carbonate of lime effervescing considerably with acids.

Friday, 1st April, 1819.—I crossed three nullas on my road to Sedashewpett, during a journey in the dark, all running eastward along a ridge of gently undulating and slightly elevated land, as seen to the eastward as day broke, apparently a continuation of the Tandmanoo range, and taking the same direction. At day break I fell in with large masses of granite lying in the black soil, and in a ravine saw plainly that it formed the substratum covered with the cotton soil, although not in all parts, the soil being granite in the highest part. To the westward are seen the flat tops of the trap hills and the peculiar abrupt termination of the iron clay of Beder. The soil in which we are, is nearly all granitic. The intolerable heat of the day has prevented my excursions for some time past. The valley in which we are is hotter than at Hyderabad.

Monday, 12th April, 1819.—I traced the trap veins into the granite and farther east than I could follow it; it is precisely similar to that of Golconda, Suldapooram, &c. I nowhere observed it in contact and passing into the granite. It extends as far as the eye can reach in an easterly direction, sometimes forming considerable elevations, and at others, sinking beneath the surface, is scarcely visible.

Thursday, 22nd April, 1819.—Twenty-six grains of the green carbonate of lime were dissolved in nitric acid; result to be hereafter mentioned. About three miles to the N. W. of the cantonment I observed a long deposit of quartz rock. The whole of the above green lime was dissolved except $3\frac{1}{2}$ grains of green earth which remained behind on the filter.

Thursday, 29th April, 1819.—Specific gravity of calcedonic agate from the Godavery: 260.

6th May.—Specific gravity of Tandmanoor basalt, 2. 816.

11th May.—Specific gravity of flint from Medcondah, 2. 63.

13th May.—Epidote from Multapoor.

Sp. Gr., 3. 312.

13th May.—Green hornblende from the Carnatic.

Sp. Gr., 3. 243.

30th May, 1819.—Here commences my expedition with Everest during the rainy season.

4th June, 1819.—To the left of the road before reaching Hyderabad I observed a deposition or bed of quartz rock which I ascended, but was not able to discern its termination on either side, its direction was due north and south. The granite in the bed of the river Mussy was reddish inclining to grey. The evening closed too soon on me to allow of any observations before reaching the camp.

5th June, 1819.—I arose with the sun and ascended the hill which rises about 100 feet above our encampment. I observed a vein of the greenstone precisely resembling that of Golconda and Secunderabad, its direction E. and W. as usual. The granite is of a greyish colour, containing large crystallized masses of felspar of a similar colour to that observed at Ardinghy.

I no longer observe loggan stones, the granite is more compact and less liable to decomposition. About a mile from the station in a westerly direction, I observed a long vein or deposition of quartz rock running north and south, probably a continuation of that observed yesterday, also on the ground numerous small concretions of carbonate of lime.

6th June, 1819.—I quitted the camp early for Chitterghat. The granite was generally of the reddish grey colour, with loggan stones, but fewer than I have observed in other parts.

7th June, 1819.—We arrived at Ballapooram, distant 8 miles from our last station, the vein of greenstone was observed to our right running nearly east and west. At one period, it crossed our path and we lost sight of it; soon after at this place we had heavy rain during four hours.

8th June, 1819.—We passed through Hyattnuggur and saw a trap vein to the right of our road which accompanied us for a considerable distance: it re-appeared at Seringhur, on the side of a granite hill.

9th June, 1819.—The granite between Seringhur and Mulkapoor

we found to be at times very red and close grained. The trap vein was frequently in our path, but very much decomposed and by an inexperienced eye would not have been distinguished from the granite. At Mulkapoor it assumed its usual character.

This place is situated at the northern extremity of a valley about five miles in length by $1\frac{1}{2}$ in breadth, the hills rise on each side to the height of nearly 600 feet, they are of granite, which for the most part is of a grey colour, containing large crystals of bluish grey felspar. The large trap vein crosses this valley which is nearly north and south, and disappears on the eastern side amongst the rocks. It is here of large dimensions and appears to contain large pieces of epidote, as I found large pieces of that mineral at its foot.

10th June, 1819.—I was one hour going to the top of the hill where a flag was fixed. I found the granite much whiter than that below, which contains hornblende and compact felspar.

The view was very much bounded by the mist, I observed a few loggan stones and the same irregular appearance of the rocks as in the neighbourhood of Hyderabad. The barometer stood at 10 o'clock at $29^{\circ} 4'$, thermometer 84° ; below the hill at $70^{\circ} 8'$, thermometer 80° . In the evening I visited the trap vein, I found a considerable quantity of epidote, also a few pieces of amethyst quartz, the vein rises due E. and W. I was afraid to trace it on account of the tigers.

17th June, 1819.—I saw several veins of the trap running in a different direction from that usual to them, they appeared however to be continuations of that large one which I observed at Mulkapoor.

18th June, 1819.—On the road I observed several trap veins and deposits on the mountains, but was not able to inspect them more closely on account of the jungle. At this place two veins were observed, the one due E. and W. coming from a considerable distance, and a small one, on which was a pagoda, nearly at right angles to it, of small extent.

19th June, 1819.—I reached Secunderabad this morning, a remarkable vein at the Mussey, probably a continuation of that of Golconda.

Wednesday, 23d June, 1819.—The hill of Bowenghir consists of a mass of granite of about 4 miles in circumference and 800 feet* in

* By trigonometrical measurement 646 in height.

height. From the plain it presents a singular appearance, the whole surface being completely bare and rounded at the top, with large masses hanging at its sides, the remains of some concentric lamellæ, part of which have fallen or slipped into the plain. On it are numerous excavations, which serve as reservoirs for water, some of very considerable depth. The colour of the granite is a whitish grey and it contains mica in separate spots. At the top is a building of a square form, formerly a palace of one of the Golconda sovereigns, the "Kootub Shahs," whose dynasty commenced in 1512 and ended in 1574. Some of the blocks of granite of which it is built are twenty feet in length. Beams of teak thirty feet in length. I observed in different parts on the surface of the granite projections of a harder and less decomposable rock which may in many cases be the cause of the loggan stones which are found here, although few in number.

Monday, 12th July, 1819.—The country passed through, Oonperty, Motamughoor, Koelcondah, Mundrick, differs in no respect in its general and particular appearances from that previously visited. The veins of greenstone are more frequent, more irregular in their direction and less continuous at Koelcondah and its neighbourhood. I observed several on the sides of the loftier hills and others at the top of the lower; in most places it was of the common kind; at Koelcondah it is fine large grained, ringing when struck and containing rather more felspar than is usual. Between Koelcondah and Mundrah, the most remarkable features were the concentric structure of the granite, the lamellæ in some instance are ten feet in thickness, their dislocation seems to have been hastened by some earthquake. The granite was reddish grey, becoming black on the weather side. On the banks of the Mussey, I noticed a trap vein apparently much intermixed and confused with the granite. At this place Mundrah, two hills in the neighbourhood, present the tabular form, there is much granite of the syenitic kind and closely resembling that of Mulkapoor. Also considerable quantities of the trap and considerable debris of quartz from veins in the granite. I have observed in many places a curious breccia of limestone, felspar, and quartz; it in some instances, resembles that on the bank and bed of the Seendy containing large blocks of granite; I have not observed it in any quantity as yet; the soil however in many places is impregnated with carbonate of lime.

Close to the base of the hill on which the instrument is fixed, a rock is broken in half by some convulsion and discovers two rounded masses of a very micaceous granite, differing remarkably from that in which it is contained, with very distinct edges, and intersected by two or three veins of granite similar to that of the containing rock. In one place the separation or slight adhesion of the two surfaces has allowed the rounded pieces of micaceous granite to fall out, leaving a hollow, such as is seen in a sandstone breccia, or pudding-stone, where the decomposition of the cement has bared the surface of the contained pebble, or angular mass, and allowed it eventually to fall out. I have long suspected that I should at least be able to prove to a certain extent that these masses which I have observed at Seeparty, at Nelgondah, Secunderabad and in other parts of this district are of anterior date. I have called it a crystalline micaceous green-stone, it is however, so small grained that I cannot now discern in it any hornblende, I shall therefore, consider it a very micaceous granite of a dark grey colour. My reasons for considering this granite to be of anterior date to that which encloses it are the following.

1. Its defined margin which distinguishes it from those veins of quartz and felspar in granite, which generally pass from one substance to the other by insensible degrees.

2. Its very different composition, the one being principally mica and quartz of a small grain rendering it very black and tough, the other an aggregate of quartz and felspar of a fresh colour and in rhomboidal crystals with a very small quantity of mica.

3. Its rounded appearance, as if it had been previously subjected to the action of some mechanical cause rounding its angles.

4. The veins of granite of the same nature with that of the containing rock and running from it through the mass.

In the immediate neighbourhood of this singular rock is a vein of the common greenstone; or rather an irregular mass without any traceable direction, since it disappears at a short distance, apparently concealed by the debris of the granite. The granite has the aspect of having suffered violent disturbance, immense masses being strewed on all sides of the rock abovementioned.

Near to the hill station is a very remarkable hill of about 500 feet in height, its tops consisting of tabular granite; its southern aspect

presents a regular but rather precipitous slope; whilst its southern one is irregular and almost perpendicular to the upper half.

Wednesday, 14th July, 1819.—I ascended the singular hill mentioned on the other side. The difficulty was very great, and I do not think I should have been able to have descended without the assistance of my bearer. Every haunt of banditti that I have ever read of, falls short of the comparison with this singular place. One man well supplied with provisions might easily defend himself against as many as could be sent against him. The passes are so numerous and the rock is so perpendicular, that it would be impossible to watch the one or scale the other. In one place a stone ready placed to close the orifice, would completely bar all farther progress. My guide informed me that it was formerly a haunt of very powerful banditti, and we saw on our arrival at the top, bricks, mortar, and in a crevice of the rock an inclosure forming a spacious apartment. The rock is entirely granite, of the same constituents as those of the rock beneath, containing rather less mica and with veins of quartz and felspar; on the pinnacle I observed in numerous shallow places containing rain water, tadpoles and other reptiles, for whose existence in such a place I am at a loss to account.

Sunday, 18th July, 1819.—I observed on the road numerous flattened masses of granite containing micaceous granite similar to that at Mundrick; sometimes very much intermixed with it, giving it a veiny appearance, at others rounded, presenting the same appearance as that before noticed; none rose far above the surface, the whole closely resembled that of Bachapilly containing small portions of carbonate of lime, the hornblende being a little darker in colour, large and small veins of the trap as usual and nearly in the usual direction.

Monday, 19th July, 1819.—We crossed the Mussey this day. I found in its bed shells resembling those found in the silicious stone of Medcondah. The river was not three feet deep, and its bed was composed solely of granite sand.

Tuesday, 20th July, 1819.—I this morning ascended the hill of Udirgutt with Everest. The granite blocks of which it is composed resemble principally the Bachapilly kind, containing pieces of hornblende, which are seen in four or five places of a mass about 3 feet in diameter. I found crystals of quartz in abundance in an alluvial soil washed down

from the hill. At its foot were vast quantities of granite, bared, mixed in all possible ways with the greenstone, exactly like Bachapilly.

30th July, 1819.—The whole of the granite in this neighbourhood is alike; the bottom consisting of the greenstone and micaceous granite intermixed with the granite in veins, blocks, &c., the resemblance of which to a stream of lava is very great and the course being always from the upper to the lower level. On this is placed the concentric lamellar granite containing small and large masses of crystallized hornblende. On this are masses with their interstices vertical, decomposing gradually and forming loggan stones, of which many are actually formed; some on the concentric granite ready to fall as soon as the decomposition of the lower surface has changed their centre of gravity.

6th August, 1819.—Just before our arrival at Singharam, we passed through a very considerable deposit of the trap the extent of which I was unable to trace from the thickness of the jungle. We passed over it for about a furlong; I observed in the river both trap and granite in large blocks.

7th August, 1819.—We passed through a very thick jungle formed principally by thorny mimosas, attended by the granite as usual; when arrived at about half our distance, without any perceptible transition, a slaty rock appeared in our path, and from the elephant's back I observed a flat platform nearly parallel with our path of about a mile in length. I walked to it and found it to consist of brownish red clay-slate, of a kind which would be useful in roofing houses. Its termination was at a nullah, in the bed of which I observed granite of a porphyritic texture passing into a rock resembling large grained sandstone, which became clay slate of the kind before mentioned. There existed no separation or line of distinction between these three rocks, and I had a fair opportunity of observing them from the lower side of the nullah of the opposite high bank in which the passage was distinctly visible. At this nullah it ceased and the usual rock granite continued to appear at intervals. About four miles from the Kishiar at the place called Pieddere, the horizontal limestone before mentioned (see page 198) made its appearance; it differed in no respect from that formerly described: it is, except its colour, a little darker than that on the banks of the river at Warripilly. Everywhere was seen detached pieces of the pudding-stone enclosing rounded and smooth

lumps of sandstone. In the few instances in which this was attached to the rock, they were found in the interstices or in those parts exposed to the action of the sun and the rain. In all places vast quantities of the debris were found in the shape of sandstone and quartz, and particularly near the banks of the river. The slope of the ground to the banks was very distinct when we were several miles distant from it. On its banks the limestone was abruptly broken off and the general appearance suggested the idea that some convulsion arising either from a subsidence of the strata or from an earthquake had formed the bed of the river. The banks were covered with alluvial soil and presented considerable quantities of the alluvial iron sand. A bráhmín told me that the extent of the limestone both above and below the river, was about 15 miles in each direction. Its extent in the other direction is about 40 miles.

Motapilly, 9th August, 1819.—I yesterday had some of the quick lime brought to me : it appeared to be good. A considerable quantity of calc spar is found in veins, and loose masses on the banks of the river and would form excellent lime. I rode to a pagoda about a mile from the camp and crossed a nullah beyond it, but observed nothing which induced me to continue my journey. In the evening I went on foot to the northward of the camp and found very large collections of the rounded sandstone, intermixed with jasper, crystallized quartz and containing in it carbonate of lime and calcedony with a white decomposed surface. In one or two places I observed the cement still adhering to the rounded lumps forming the pudding-stone. On all sides were numerous deep fissures in the limestone rock, through which the torrents flowed, smoothing the rough edges of the limestone. I should have before mentioned that the strata appeared generally to dip a little to the E N. E., this dip however, is in some places scarcely perceptible.

Piedderree, 11th August, 1819.—On the road I observed bits of the clay slate, but the rock itself no where visible. I observed a vein of trap running about three miles in a N. E. and S. W. direction, considerably elevated above the granite; which contained many pieces of the micaceous granite before described, in the flat masses near the village.

13th August, 1819.—I observed nothing but the limestone. It appeared to have undergone some convulsion, the strata lying at various

angles of inclination and generally at about 25° . The greater part of my road lay through alluvial soil, the limestone appearing only at intervals; near the river nothing else was visible. I observed in many places that the calcareous cement or pudding-stone laid in the horizontal interstices of the limestone, and in no instance did I find it covering any extent of surface.

14th August, 1819.—The limestone as usual for about three miles, when it appeared to pass into clay slate, and at last became covered by a quartzose rock, which without any appearance of stratification formed a range of 150 feet in height, branching off in different directions; its general one being nearly the same with that on the other side of the river (E. and W.) and probably of the same composition (Pooly-chentah). To arrive at Moogtial I was forced to make a considerable detour, the road lying through land which had been covered a few days before by the overflow of the Kistna. Moogtial is a small town in the English territory with a fort occupied by the Zemindar. I pitched my tent close to the river and near a quarry of the limestone, in which I observed many large blocks some twenty feet in length, lying close to the water edge as if ready for water carriage; the blocks were cut out of the solid rock to the requisite thickness, and wedges inserted in the interstices of the stratification and the block was complete.

Anantagherry, 15th August, 1819.—I observed the calcareous compound again in the interstices of the limestone and am forced to conclude that it is of contemporaneous formation. This rock is still visible for three miles, when the ground appeared covered with pisiform iron ore and alluvium. At the village of Boodoor and on the banks and bed of the Paleer, a clay slate formed of layers of *blue, grey and red*, horizontal, and covered by the quartzose rock before described; this was soon succeeded by the granite and its usual accompaniments trap veins. One remarkably large and distinct one appeared continuous with that of Lingageree before mentioned.

Anantagherry, 16th August, 1819.—I this morning breakfasted with Everest who gave me specimens of clay slate from Polychinlah; of brown iron stone from Sarangapilly; and of a mixture of chlorite slate with limestone and quartz from between the two stations. The upper part of the Polychinlah ridge, is of quartz rock crystallized in rhomboidal pieces and rapidly decomposing.

Anantagherry, 17th August, 1819.—On the south side of the hill of Anantagherry, a very thin vein or dyke of basalt is seen running in an east or west direction through the concentric granite. At the bottom of the hill it is first seen about a foot broad and continues about 100 feet upwards, gradually decreasing in breadth until only a line in thickness, when it disappears. It runs in a zigzag manner and does not project above the surface. In it are enclosed small pieces of granite, which is of the same nature as that of the hill. The granite contains compact felspar of a green hue, and the basalt glittering crystals of basaltic hornblende. This basalt is easily fusible before the blow-pipe.

Hydershabeepett, 20th August, 1819.—In the bed and on the banks of a river running near this place, the mixture of the granite and trap is very remarkable. In some places it is enclosed in it in the same mode as the micaceous granite of Solokoondah, in others running in thin veins, and lastly mixed in streaks, as if it had been melted with it and flowed down.

Hydershabeepett, 23rd August, 1819.—On the top of the hill I saw in many places the rounded masses of micaceous granite enclosed in the rock, which itself contained large scales of mica and garnets and was in beds, generally very large grained and decomposing very fast; the top is above 500 feet above the plain.

Hydershabeepett, Saturday, 28th August, 1819.—The bed of the river which flows near this village, presents a very remarkable mixture of the granite and trap in veins, and in rounded masses. The former appear to be of later formation, since a vein passes through one of these rounded lumps. The same vein is also heaved out of its course several inches by some convulsion. I was able easily to fuse a small piece of it before the blow-pipe. It more nearly resembles the basalt vein of Anantagherry, than the common greenstone vein which is also not so easily fusible.

Monday, 30th August, 1819.—I observed on the summit that same mixture of the granite as before mentioned. At this village I observed a small rock with concentric layers and the mixed granite.

Sunday, 12th September, 1819.—The hill of Babecondah is a mass of concentric granite about 500 feet above the plain and occupies the centre of a range of broken hills of the same nature, running about 5° to the west of north and extending three or four miles. The principal

rock is granite of a grey colour with a considerable quantity of quartz and very little mica. It encloses masses of micaceous granite as usual, some of which are bent into various forms, differing probably from the original, and when they were in a semifluid state. I saw also on different parts of the summit and sides red granite with large crystals of felspar, also enclosing the lumps of micaceous granite. The hills to the eastward of this station present one continued waving outline of forty or fifty miles in extent, gradually diminishing in height to the N. where they become flat and present openings in their course, not very dissimilar from those in the environs of Beder. At their highest part they present two or three small peaks, but their general outline is waving without the ruggedness of the granite.

Yesterday I went to see a quarry of calc tuff about three miles to the N. W. of Ingourtee. It differs very little from that so commonly spread in this country.

Wednesday, 15th September, 1819.—We passed through a defile in a range of mountains running nearly North and South composed of granite, with quartz rock strongly impregnated with iron lying over it. On the descent from the opposite side I observed clay slate, but not in distinct strata, until I had advanced about one mile and near to a river, when it appeared at intervals running horizontally or with a slight inclination.

In the bed of the neighbouring river, I observed bits of granite, limestone, clay slate, quartz rock and agate; its banks being about 15 feet in height and alluvial soil.

Thursday, 16th September, 1819.—Our camp was this day pitched in the neighbourhood of a nullah which was at the foot of a range of small hills, and on the banks I perceived clay slate in large masses without regular stratification and lying on alluvial soil. The bed of the nullah consisted of quartzos esand. We passed through on our way to Commerarun, winding through the vallies formed by the broken ranges of mountains, a fine alluvial tract, the substratum being only visible at intervals, which at all times and without any perceptible difference of level was clay slate, sandstone and quartz rock. Near to Commerarun in passing through a defile composed of an alluvial red clay, I observed on the surface, numerous agglutinations of ironstone very much resembling the iron clay, the ground being at the same

time strewed with black magnetic ironstone similar to that of the red hills near Madras, and broken pieces of quartz rock. The village of Commerarun is finely situated in a circular plain bounded on all sides by waving hills of clay slate, rising from 200 to 600 or 800 feet above this.

Friday, 17th September, 1819.—I ascended an elevation, at the foot of which our camp was pitched; I found it to consist of indurated clay slate in vertical strata. Its natural fracture from decomposition was in an oblong thin lamellar piece, with sharp edges; some which I observed at the top was rather porous.

Saturday, 19th September, 1819.—I started at 4 o'clock, and halted at a village called Mocarra. From Commerarun the rock was principally clay slate, with quartz rock lying on its surface in broken pieces; the valleys between the hills were very narrow, and the sides of the hills precipitous, with fine cascades of water rushing over the disrupted strata, which generally dipped to the S. E. at various angles. One mountain near my halting place had a tabular form with something like sandstone or quartz rock on the top. In the beds of the nullahs near this I generally observed angular and rounded masses of this rock.

Anchitipilly, Sunday, 20th September, 1819.—A short time after day-light, having started at 3 o'clock, I observed sandstone in very large masses, little elevated above the surface. The greater part of the road lay through alluvial soil covered with forest trees and a thick jungle. At 2 o'clock I arrived at Paloounchali which has a large square fort built of sandstone with bastions at each angle. The Godavery is 15 miles distant, due East.

The country from the clay slate to the Godavery, is sandstone cemented by alumine. It appears in some places to be in a state of rapid decomposition. The range at Paloounchali 1,000 yards from the fort is 600 feet in height? Mr. Burr says 1,200, which I doubt; 5 miles in length and a mile in breadth is composed of the sandstone and it runs due E. and W. Hot spring of Bougah: Mr. Burr says, it is sulphureous; hills in the neighbourhood very lofty, the Mooee Enoo river of Paloounchali runs into the Godavery.

The temple of Buddrachellum a remarkable object; Boorgamallapadu, in its neighbourhood, is said to contain diamonds,—a hill called the needle hill of Pachapilly, are remarkable peaks on the other side of

the Godavery and part of the Vindhya range which runs N. W. and S. E.

Monday, 24th September, 1819.—The holes so frequently interrupting my night march appeared to communicate with gullies under the surface of the alluvial soil and running on the sandstone beneath.

Tuesday, 25th September, 1819.—The tabular mountain of which I have spoken on the 19th is near the place where the clay slate first makes its appearance in coming from the eastward, in stratified masses little elevated above the surface, a S. E. dip and an angle of about 40°. The change in the soil was very perceptible, the traces of travellers dried by the sun showing adhesiveness and clayey composition. The hill above alluded to had its upper half, at least, composed of sandstone. The access was too difficult and my time too short; at a distance the precipitous hills and rocky narrow vallies commence.

The clay slate is generally very much indurated, contains large and small veins of quartz; I observed also quartz rock or sandstone about its centre. The explanation that first presented itself of the phenomena which were here seen on so grand a scale was, that all the clay slate had been originally covered with sandstone, and that a general and partial subsidence of strata had taken place, producing on the one hand the dip to the S. E. and on the other the central isolated masses with precipitous sides and covered by the sandstone which had remained in its original state.

Tuesday, 28th September, 1819.—I ascended the hill of Punchbuddoll twice during my stay at Commerarun. The road to it lay through a plain of six miles intersected by nullahs, containing most generally angular pieces of sandstone and clay slate and very little alluvial mud. The ascent to the hills was about 4 miles in length and lay over quartz rock or sandstone and slate. In the ravines quartz or sandstone alone was to be seen lying in the strata, but horizontal. The principal ravine I passed had apparently been formed by a slip of the strata, one side being perpendicular and the other a gentle slope.

Komarum, 30th September, 1819.—During this day's journey I nowhere observed the iron clay; the greater part of the road lay over alluvial clay. At times indurated sandstone or quartz and clay slate of the kind described at Allatoor, small pieces very much decomposed and passing into clay.

Bondoll, 1st October, 1819.—The road lay as usual over alluvial soil and clay slate. In the beds of the nullahs both the latter and sandstone were observed during the last six miles. We passed over a hill consisting solely of sandstone which we saw in very large blocks and rapidly decomposing.

I examined the sand of a nullah and found it to consist solely of quartz grains, although the stream was very turbid, which I suppose to arise from the aluminous cement of the sandstone.

Yellapooram, 2nd October, 1819.—We began to cross the N. and S. range of mountains consisting of quartz rock or sandstone and clay slate. The first ghaut we passed consisted of large masses of sandstone decomposing very rapidly. This was intermixed with red and brown ochreous ironstone. At the distance of four miles after passing a small nullah, on our left appeared an abrupt lofty elevation of sandstone; the masses presented on their surface and sides indurated veins of a substance composed of grains of quartz and brown ironstone of much greater hardness than the sandstone and therefore projecting from less facility of decomposition. Not far distant from this and in a position which warranted the idea that they had fallen from the precipice lay large masses of puddingstone, composed of white and brown pebbles of quartz with a sandstone matrix. I saw from beneath that the upper part of the rock was composed of this, whilst that underneath it appeared to have few or none in it. This continued for a mile or more, when the iron clay was observed in large distinct masses and mixed with the sandstone, both in veins, lying as it were in the interstices of different blocks, and mixed with it, forming a conglomerate rock. This occupied a very small space and was succeeded by the sandstone, the beds of all the rivers were composed of quartz sand.

Warungull, 12th October, 1819.—I observed a considerable number of pieces of jasper lying loose and that the neighbouring elevations were of sandstone. It was dark when I began to ascend the hill; but having ascended it every day we remained at Yellapooram, my observations are all given together in this place. The sandstone is rarely seen in the plain, being covered with an alluvium, the paths and beds of rivers are all sandy. On commencing the ascent the sandstone presents itself in large unstratified masses, with its surface coloured from decomposition, being nearly black exteriorly and interiorly of a

yellowish grey. I observed in various parts, the indurated feruginous waving veins or partitions before observed, p. 289. Also loose pieces of jasper iron ore, and quartz with a large proportion of iron. The top of the hill was composed of sandstone in which pieces of lithomarge were prevalent, and the rock itself appeared to be cemented by that mineral.

Mr. Ralph told me that the rocks all the way from Paloonchah to Mungpett were of sandstone, and that greenstone was found in the bed of the river. He gave me a piece of brown iron ore, jaspery iron ore, and an agate found on the road. He was travelling towards Sinsillah, a place noted for its iron mines and manufacture of steel: of which Conah Rao showed me a specimen in a very handsome dagger.

November 7th, 1819.—The whole of yesterday's journey was through trap and granite. The former of the usual appearance; the latter very indistinctly seen above the surface until we arrived at the bed of a bamboo river,* where it was seen in considerable blocks. Here I was told that plates of mica were procured. I accordingly observed that some of the granite was very micaceous and very white; we arrived at dusk near the river.

December 19th, 1819.—Left Secunderabad on the 18th. On crossing the Mussy I observed nearly the same appearances which I have before noticed on a former journey: I arrived at Ombrepett in the evening. This day I observed abundance of the red granite, and the vein of trap which I have before mentioned entirely disappeared. In the evening I rode to our former place of encampment with Ralph; I observed large masses of granite lying on the surface of the main rock the result of the decomposition of the last rains.

December 20th, 1819.—I gathered on my way to this place, Gorampullee, some red granite with hornblende, and some specimens with limestone intermixed with it; I began also to see the calc tuff at Uddajuth. The descent this day was considerable, although the distance travelled was not more than 12 miles.

December 21st, 1819.—In crossing this day our old station of Uddajuth and the Thieves' hill, granite as usual and veins of trap.

December 22nd, 1819.—Great quantity of granite with pieces of the micaceous granite enclosed, also pieces of the greenstone in veins and lumps. Nakurkull.

* So in MSS.

December 23rd, 1819.—Granite as usual, and camp at Sooriapet, beyond the Mussy, the bed of which is here very broad; I observed no rocks.

Mungal, 24th December, 1819. Granite as usual.

Shermahommedpet, 25th December, 1819.—I gathered some granite on the road to this place, here I first saw the black soil.

Nundigaon, 26th December, 1819.—On my road from the last village to Nundigaon, I ascended a hill, at the foot of which the road ran. It was composed of granite, which here and there contained lumps of the micaceous granite. Its upper third was composed of granular quartz rock, or it may be called a highly crystallized sandstone. I also observed near Nundigaon a vein of basalt passing through the granite, which was of the usual kind, but contained more hornblende than usual.

Chinchirlak, 27th December, 1819.—A coss distant from Purteal, we quitted Chinchirlak at day-light to go to the diamond mines at Purteal, which lies nearly south of the former, about a coss. We passed through the black soil covered with fine crops of jouwarrie; about three miles to our left was a range of mountains which bounded the plain to the eastward running due north and south. On the other side were the indistinct ranges of Polychinta on the banks of the Kistnah and before us those of Condapilly. On our approach to Purteal we began to perceive many rolled pieces of quartz, greenstone, jasper, sandstone and granite; evidently not the debris of the neighbouring mountains. The mining process had been sometime abandoned, and the workmen were employed at the site of the old excavations in resifting the old rubbish; the produce of their labour scarcely repaid them with the means of subsistence. The old excavations were very numerous, and about 20 yards square, and filled all over with water and rolled stones, I found a breccia limestone containing quartz, garnets and jasper. They were of an irregular form and did not appear to have been subjected to the action of running water; I enquired if diamonds were ever found in them, and was answered in the negative. The process of searching for diamonds performed before me was as follows. The large stones were first thrown on one side and the remainder of the heap carried into a raised platform of mud where from a sieve, the large ones were dropt on the ground by means of a lateral motion of the hand and the dust remaining deposited in another mass which was spread abroad, wetted

and gone carefully over by another person. In the course of his search he laid by the agates, cornelians, jaspers, sapphires, garnets, &c. which are said to abound. I purchased the whole stock of diamonds of the village, amounting to 3 oz., for 4 rupees, and some cat's-eye, garnet, sapphire, jasper and calcedony for 2 rupees. The village was in ruins and the people did not appear so well fed or clothed as those of the village we came from. On returning to the tents I visited a rock nearly in the centre of the plain, consisting of three peaks, which suggested the idea of the pinnacle of some deep-seated granite mountain. The granite was very red and containing hornblende in crystals. After breakfast, I went due east from the camp, three miles, to visit the range of rocks I have before mentioned. I found them to consist of granite, composed of felspar, hornblende, quartz and some mica, which however was not always to be distinguished. Two things are well worthy of consideration respecting the situation of the diamond mines: they are surrounded on all sides by the alluvial black soil, which has originated in the inundations of the Kistnah. They are not elevated above this soil, and I should imagine were once covered by it, although they at present appear elevated from the quantity of earth thrown out from the different excavations, of which I counted at least twelve.

2. The neighbouring rock is of that kind to which it is difficult to assign a name, although its constituents are very distinctly marked, namely, felspar and hornblende, yet from the equal mixture of those two minerals I should prefer the name of syenitic greenstone. It is worthy of remark that the mountains six miles distant are of vertical gneiss.

Ibrahimpett, December 29th, 1819.—We arrived at this place crossing the end of a range of irregular hills which appeared to run nearly due N. and South. I conceive that Dr. McCulloch would call the rock syenitic greenstone; or perhaps would call it merely a modification of the granite of which the whole of the basis of the country is formed. Unlike, however to the out line of the hills of granite to the N. E. North and N. W. they exhibited no loggan-stones and no bare summits but were covered to their tops. After breakfast we went to Condapilly and there saw Mr. Spry who inhabits the old fort, at the foot of the range which in Heyue's Map commences at that place running due N.

E. and which he has named gneiss. Ibrahimpett is on the left bank of the Kistnah, which is about twenty feet in height, composed of the black soil; the bed is however very sandy and very broad, perhaps two miles.

Bezwara, December 30th, 1819.—Our road lay in the bank of the Kistnah, which river suddenly contracts to run through the pass of Bezwara formed by two hills of gneiss that appear to have been separated by force; according to Dr. Heyne the range is continued to the N. E. I ascended and found his description correct, except that I did not observe the ochre which he spoke of as mixed with the other ingredients composing the rock. In some places the stratification was not all distinct but appeared massive like common granite. Veins of felspar traversed the rock, and in many places I observed black spots on the rock, arising as I suppose from oxydation of the Iron.

December 31st 1819.—I crossed the river early to visit the caves near the village of Ungley. They consist of three excavations one over the other; the roof is supported by pillars of the usual form in Hindoo temples. Around the walls were different relieves very much mouldered. The upper story contained a colossal figure of 25 feet in length, lying on stones in a recumbent posture; around him on the wall in relief, figures of deities; and two colossal figures which appeared to protect his slumbers. The whole was excavated out of the gneiss rock, which is very fast decomposing, the decomposition taking place principally in the centre of the pillars. The lower excavation leads, it is said, to Mungulghery about three coss distant. In returning down the causeway cut in the face of the rock I observed what appeared to be limestone mixed with the granite, also something bearing the appearance of manganese. The rock consisted of quartz, felspar, mica and jasper in great abundance; the stratification in the Bezwara hill was very evident from this side, the dip of the strata was to the eastward and the angle about 70 or 80°. The range suddenly takes a turn to the N. E. to the northward of Bezwara forming a portion of segment of a circle. I a second time ascended and reached the summit of this hill. The prospect was commanding and embraced a field of 30 miles each way; perhaps much more, as I was told, Ounda was visible on a clear day, distant 40 miles. The range of Chintapilly or Pooley Mintan was very distinct as well as the Guntoor districts near Ardingby. It may be remarked here that the

decomposition of the gneiss although rapid does not supply a rich soil. The figures in the pyramid appeared to have had their damage sustained from this cause repaired with plaster, which was fresh enough to lead one to the supposition of its being modern.

January 1st, 1820.—I went to Munglegherry at eleven o'clock; two miles of our road lay over the black soil, and was succeeded by that arising from the decomposed gneiss in the passes through which our road lay. The difference of level was very perceptible, the latter being the highest ground, and if the alluvial black soil has been deposited as I suppose by the floods of the Kistnah, the phenomenon admits of an easy solution. Munglegherry stands at the southern termination of the remarkable range of gneiss rocks, which is continued with several interruptions to the bed of the Kistnah and re-appears on the opposite bank at Bezvara, the passage of the Kistnah between the precipitous sides of each mountain forming the celebrated pass of that name.

The tower in front of the pagoda of Munglegherry is about 100 feet in height, it is composed of 12 stories of the usual form. It is built of a red sandstone containing large and small grains of quartz. The variation of the compass, supposing the pyramid to be N. and South, is about half a point. The stone had been recently brought from a considerable distance according to the Brahmin. The sculpture and relievos were much inferior to the specimens of those from Amrawutty.

Masulptaur, January 4th, 1820.—Yesterday morning at 11, I arrived, after passing for the greater part of the journey over black cotton soil, which was succeeded by sand about 3 coss from Masulipatam. Immediately also commenced the groves of *Borassus flabelliformis*, and *Euphorbia Tirucalli*, both of which grew very sparingly on the former soil. I was particularly struck on arriving at the sandy soil with the mirage or appearance of water, with trees, and houses reflected on it. On passing through the Bazar I observed many stones resembling those of Amrawutty, and which, as I was informed by Mr. White, had been brought from thence.

The sand in some parts was covered with the magnetic iron ore, mentioned by Dr. Heyne in his tract on the Circars.

February 5th, 1820.—Analysis of limestone from the Kistnah:

Carbonate of lime	84 .
Silica Alumine Iron	16

February 9th, 1820.—Left Guntoor at five o'clock for Bellumcoondah at dusk, and at the distance of three coss N. W. of Guntoor, I crossed a low range of syenitic greenstone; the specimen I have preserved presents on one surface a very considerable quantity of hornblende in crystals mixed with a small quantity of felspar, and on the surface some spots much resembling mica. I have now so frequently met with a mineral resembling equally hornblende and mica that I am constrained to think with Mr. Brande that they mutually pass into each other. The range from which I procured my specimen had partly the concentric structure, which distinguishes the granite to the N. and partly a concrete structure; that being generally at the uppermost part of the rock. At day light on the—

10th February, 1820.—I arrived at Bellumcoondah and prepared immediately to ascend the hill. I took the height of my barometer within 30 feet of the top. The remains of the fort and of the building are of Hindoo architecture; some of Moghul. The rock is principally composed of a granite containing quartz, felspar and small spots of the substance intermediate between mica and hornblende. In general outline it resembles much those rocks to the northward, such as Coil-kondah, &c. having nearly the same direction, and like them veins and distinct masses of greenstone running through it. I observed at the summit of the hill a very large piece of greenstone, which seemed to have survived the decomposition of the rock in which it was once enclosed, from its greater toughness. The appearances however of the granite were not always the same; sometimes the felspar became red, and the whole contained a greater quantity of mica; quartz impregnated with chlorite was sometimes found in veins and detached masses.

Upon the whole I have no doubt that the granite is of contemporaneous formation with that to the N.

At $\frac{1}{2}$ past 2 o'clock I left Bellumcoondah travelling at the foot of the granite range for about 4 miles. The plain I then entered frequently presented isolated masses of granite, decomposing rapidly, and giving rise to a red siliceous soil which did not appear very productive. On my left to the N. W. I saw the range of Chintapilly characterized by its being crowned with quartz rock or crystalline sandstone. The lower formation seemed continuous with the granite of Bellumcoondah.

Amrawutty, February 11th, 1820.—I arrived at this place at sunrise and immediately mounted my horse and visited Depuldinny. I found a circular excavation about 300 feet in diameter, its angles facing the intermediates to the cardinal points; all the stones dug up had been removed to a bungalow hard by, belonging to the Rájáh. I noticed two capitals of columns partly visible, the earth not having been cleared away from them, I bathed in the river, jumping from a mass of granite rock which projected into the Kistnah; there were many quartz veins running through it, it resembling very strongly No. 7. On my return I made a detailed examination of the stones in the bungalow, No. 25. I then re-visited Depuldinny. I had leisure to notice that the area occupied by the stones, was circular and 100 yards in diameter. It is probable that the extent is somewhat greater, since I observed some of the circular capitals bisecting the circle in a direction E. and W. The area contains a well dug by the Zemindar Jugganauth Row, about 15 yards square, the depth about twenty feet, the upper half the calcareous breccia or pisolite, the lower micaceous schists in vertical strata injected with veins of the calc breccia, both vertical and horizontal, communicating with each other. I afterwards paid a visit to the pagoda: nothing remarkable but the inhospitality of the Brahmins. I crossed the bed of the Kistnah to Autcom, the bed is three miles wide and contains a very large island, on which I observed the thistle; a few esculent grains growing on the black mud of which the upper part is formed. The old man Apparoo, whom I had previously seen at Purtea¹ made his appearance. He told me that the greatest depth of the diamond mines was 18 or 20 feet, and they then came to an earth called Nushar, which was soft, and that the real reason that fresh ground was not opened was from the want of capital to begin; the price of labour was a seer and a quarter of joourrie each man per diem. No diamonds had been found in any of the villages for a considerable period. At five o'clock I went to the diamond mines with the Kurnum, sending my bearers on towards Condapilly. I saw nothing but heaps of old stones and earth by the side of the excavations. The calc tuff and the pebbles of jasper and quartz were the most conspicuous in the excavations; but I was told that there was a considerable quantity of fresh ground to the north. I arrived at Condapilly at nine o'clock.

Condapilly, February 12th, 1820.—I ascended the hill of Condapilly at sunrise but was unable to proceed farther than the palace and fort.

from fatigue. The hill appeared to be composed of one rock, syenitic greenstone; the appearance of a crater was particularly remarkable in the centre of the hill. I descended and found that Captain Grey had arrived during my absence. I quitted it in the evening for Mylaram and arrived at Ankerpilly on the 13th February 1820.

After remaining a greater part of the day I ascended the hill, the east side of which is occupied by 4 pagodas in succession. I found the rock to be granitic, but twisted to a great variety of forms, sometimes resembling the mica slate at Aberdeen, sometimes that of lava. I was much surprized at the obscene figures on the car of Juggernaut carved in wood. I left in the evening and arrived at Malavilly at night.

At sunrise on the 14th February, went to the mines which are in obliquely elevated land about a mile from the village. I was attended by one of the miners who had formerly worked there. The excavations were deeper and longer than those of Purteal. The depth to the diamond bed consisted of three layers of earth occupying a space of about twenty feet. The rocks in the neighbourhood appeared to be of granite, or at least resembling it. I had not seen any thing of the black soil from my leaving Mylavarum. There is a considerable quantity of ground which has not been examined, the whole ground occupies a space of a coss surrounding the whole village. I was informed that the cause of the working of the mines having ceased was want of capital, and the disinclination of the landholders to their extension.

There is a formation there common to all the diamond mines that I have seen, namely, the calcareous tuffa; the more I see of this the more I am convinced of its affinity to the iron clay formation, and that it will be found passing into it. A short time after leaving Ankerpilly the palm trees made their appearance indicating our approach to a siliceous soil. Two or three coss from Ellore I entered on a spacious plain resembling the dry swamps of Masulipatam and its neighbourhood. The soil was for the most part red, containing silex and alumine, but in the immediate neighbourhood of Ellore the cultivation had impregnated it with more vegetable and animal matter. At Ellore I met a surveyor of Colonel Mackenzie's (Mr. Donegan) who showed us some of his maps. I observed that throughout the Guntoor district the level gradually descends from the banks of the Kistnah, this I ascertained from the bund of the tank being most generally toward the sea. The

scale of this map was one mile to an inch. He also observed that the sandy soil and its stripes of palm and cultivation, extended about 6 miles inland all along the coast, and he expressed his opinion that it owed its origin to the winds that blew it from the sea shore, and not from the desertion of the sea.

I left Ellore on the 19th February, at six in the morning for Rama Singhwaram $13\frac{1}{2}$ miles: for the first two or three miles open country and thin cultivation on the soil common to the neighbourhood of Ellore. It was succeeded by red soil and pisiform iron ore, similar to that covering the iron clay, at times large pieces of a conglomerate resembling the iron clay of Midnapore, and red iron ore.

February 20th, 1820.—After travelling from four in the morning I arrived at this village nine miles distant. On my arrival at sunrise I ascended the hill, my barometer not being with me I could not take it up. I found the rock to be sandstone, the cement lithomarge, which was also found in it in large and small amorphous masses, together with jaspery and red iron ore; rounded pebbles of quartz were intermixed, and it strongly resembled the rock of Yellapooram and the country around, containing in it those linear shells* of a black ferruginous substance and presenting in no instance appearances of stratification. One part of the rock which I visited and which had been hollowed out artificially was studded with bits of lithomarge white and pink, and had the projections which I mentioned as having been observed on my march to Jellapoorun last year, the dome was an excavation in the rock forming a small chapel with a cupola from which ribs descended to the girdle; the lingam was of a solid piece of rock but decomposing very fast. I observed in my evening's walk two large trees growing near the tank, of the *Strychnos potatorum*.

Monday, February 21st, 1820.—I left the village of Narsapoor an hour before sunrise, our road lay between the vallies of the sandstone formation, and was rendered difficult by the loose sand into which it had decomposed. The elevations were slight and the ranges much broken, their connexions with the vallies generally by an easy slope.

The horizon around us is entirely concealed by hills, the general direction of which is N. E. and S. W. their outline rather flattened and rounded with a few conical elevations. We saw the hill forming

* So in MSS.

one side of the pass through which the Godavery flows, distant about 40 miles. The soil appears very productive but does not contain any carbonate of lime. The hills are covered to their summits with trees and jungle.

Tuesday, February 22d, 1820.—After a very fatiguing march through the jungle, in consequence of losing my way, I arrived at Ashwarroopoor. We passed the frontier a short distance before our arrival (1 coss). There I saw numerous pieces of red iron ore, rounded and amorphous, the soil and other appearances generally resembling that of the iron clay. I paid a visit to the Rajah of Paloonshah, who is the owner of the village. I saw a well about 35 feet deep; the lower 20 feet consisted of a mixture of clay and sand of a whitish and yellow colour, easily friable, and not effervescing with acids, on the one side, and on the other a loose mixture of clay and rounded pebbles of iron stone; in short the iron clay in the most imperfect and unconnected state. The white clay and sand appeared to contain in it some extraneous bodies, but their forms were too undetermined to enable me to guess at their nature.

Wednesday, February 23d, 1820.—I rose early to go to the ruins of an ancient village called Polarum, and in my way crossed a nullah which was reported to come from the hills and to run the whole year. The soil appeared generally to be highly capable but covered with jungle. The village we went to visit was a proof of the former extent of cultivation; even its ruins are covered with jungle.

Thursday, February 24th, 1820.—In the evening I went to the neighbouring hill, a low range running nearly north and south, and to my surprise found the hill composed of syenitic granite in which the felspar was smallest in proportion, and the hornblende sparingly distributed.

On the surface of several masses I observed hornblende in crystals, the thickness of the jungle prevented me from seeing to any distance round. At the bottom of the hill I observed pieces of the conglomerate sandstone in abundance but saw no rock visible.

Merripulle, Friday, February 25th, 1820.—The road was strewn with debris of the syenitic rocks. In one place I observed rounded pebbles resembling those found in the conglomerate; also pisiform iron ore. About 2 coss from the last village I crossed a small nullah in the bed of which was granite and the sand granite.

In a second nullah close to the village the banks were of alluvial clay, they contained very large masses which presented, in one or two instances only, a stratified appearance with a south-east dip, of an angle of 70 degrees. The granite contained felspar, mica in crystals, hornblende and quartz. I also found in it veins, with all those ingredients, but in much larger masses, the veins were parallel to the stratification. In a vein composed principally of whitish felspar, I found crystals of corundum and tourmaline, the latter of a pale green.

The vein was parallel to the dip of the strata; on passing farther on, below the river, the same kind of granite in large masses and without any appearance of stratification occupied the beds and banks. It sometimes contained masses of red and white crystalized felspar the latter containing small specks of mica. I saw at the distance of about 20 miles the peak of Rachapilly. The general direction of the mountains is very difficult to be made out, but that of N. E. and S. W. the nearest. The sand of the river was granitic, being composed of the debris of the granite and small garnets.

Thatkoor, Saturday, February 26th, 1820.—This place is about 13 miles N. W. of the place where Mr. Burr was taken ill last year, and where he terminated his survey of the Godavery; on our road hither from Merripullee we crossed the river twice, and found in its bed the same kind of granite and granitic sand. We saw two cultivated spots of land in the forest on our way to this place.

After dinner I went to the Godavery about a mile and a half to the eastward, the bed consisted of granitic sand mixed with calcedony, carnelion, agates, jasper, and flinty slate: the banks were about 40 feet in height and composed of the black alluvium, and the bed a mile wide; on the opposite side of these were lofty hills and one particularly remarkable for its peaked summits. The village of Rachapilly is very near it.

Sunday, February 27th, 1820.—We rode in the evening to the bank of the Godavery. Having descended it I went about $\frac{1}{2}$ a mile on the sand, until we came to a bed of rocks in the river. We found them to be the slaty granite or gneiss. On our return we picked up the same stones which we observed yesterday.

Monday, February 28th, 1820.—We arrived after rather a fatiguing march at Coveeda, which is on the bank of the river. In the evening

I descended the lofty bank which cannot be less than 45 or 50 feet in height, whilst the breadth from bank to bank must have been $\frac{1}{2}$ a mile, we measured three hundred yards of dry sand, and the remainder was about 800. There were a number of people called Reddies, sitting on the opposite bank, watching our motions: I began to light watch fires very early.

Tuesday February 29th, 1820.—We arrived at Kaukusnorr leaving our large tents behind us, the road being impassable for bullocks, horses and elephants. From the steepness of the rocky bank we were obliged to make a considerable circuit amongst the hills; we crossed several times during the morning a river which we were assured was never dried up during the hottest season. In two places, I observed on its bank masses of a rock resembling the iron clay of Midnapore, which contained pieces of black iron ore resembling the slag of a blacksmith's forge. Our road lay through the hills and in a very circular route. In the afternoon we travelled along the river side to Perunapullee a small village with four small houses. Near it a rapid torrent rushed from the summit of Papeondah into the river. We returned by torch light.

This was the limit of our journey by land.

Wednesday, March 1st, 1820.—We left the village of Kaukusnorr in one of the rude canoes belonging to the cultivators, who are here called Reddies, dwelling on both sides of the water. I had first ascertained the temperature of the water at sunrise and found it 10 degrees higher than that of the atmosphere, which was 64°. The temperature rose and fell repeatedly during our short voyage to Peruntaputtee. On landing I examined the temperature of the mountain stream, 68°; that of the air being then 72°; about 9 o'clock. After breakfast we again betook ourselves to the boat and proceeded in an easterly direction as far as the village of Poloor where the river takes rather a sudden turn to the southward, and is confined by the bases of the lofty hills of the Papicondah pass which we estimated at 2000 feet above the river level, we proceeded, still confined by these lofty banks, until we found ourselves distant about a mile from a village called Sri Raca and a mile and half from Caroor both Company's villages and on the right bank of the river. At this place we found two masted boats proceeding with sails at about the rate of two miles an hour up the river for wood, empty; they belonged to Rajamundry, distant about 15 coss. Polavaram about 7 coss.

We set out on our return about 3 o'clock and soon found ourselves relieved from the intense heat of the sun's rays by the shadow of the lofty mountains. As we returned we had leisure to remark in various parts of the river small accumulations of sand and various nooks and jutting points, but no black alluvium, which renders it probable that the mass of this soil is deposited at and before the entrance of the pass which is at Coloor: we gave the name of Ráma's peak to the highest on the right bank, and that of Sitá to the highest on the left, and to the other (one-tree hill) Latchman's peak. I was well pleased at the opportunity I had of passing through this lofty ravine. I had entertained doubts previously of the propriety of calling the formation gneiss, the slaty structure being so rare and that of the concrete massive being much more common. Here I had an excellent opportunity of observing that they resembled generally the granite hills of Scotland in their peaked summits, and in their angles corresponding generally with that of the fracture of the smaller masses: the general structure of the granite was felspar of a very pearly lustre and easily dividing into rhomboidal pieces; quartz, and garnets.

On the General Vibration, or Descent and Upheaval, which seems, at a recent Geological period, to have occurred all over the Northern Hemisphere.—By GEORGE BUIST, L.L. D.

The whole of the Desert betwixt Cairo and Suez bears the clearest evidence of having, at no distant period, been under the bottom of the Sea.

After a fall of rain an efflorescence of salt still appears on its surface. The gravel consists of rolled pebbles, mostly portions of the adjoining rocks. It is every where mixed with sea shells. The Desert at the Centre Station reaches an elevation of 800 feet, and shells are said to be found at the elevation of 2000, both on the African and Arabian side.* This most probably has been elevated at a remote period in comparison with the date of the upheavals along the shores of the Red and other Seas about to be noticed.

* Dr. Wilson's Lands of the Bible—Dr. Hoffmeister's Travels.

All around Suez there is a vast expanse of level plain extending from two to twenty miles inland, diversified, here and there, with hillocks of drifted sand, obviously the effect of the wind. A section of the material of which the plain is composed is exhibited along the sea shore. It is about eight feet above high water mark, and consists entirely of sand, gravel, and shells perfectly fresh, and apparently of the same varieties as those on the beach. This upheaval extends, with little or no interruption, all the way to Aden, unless where the cliffs advance boldly on the Sea. A similar beach, at a similar elevation, is found all around the peninsula of Aden; and though I have had no means of personally determining the fact, I have no doubt it will be found all along the Arabian coast, around the Persian Gulf, and so on to Scinde, and by the shores of Goozerat and Cutch. Of the Delta of the Indus I shall have occasion to speak by and by, and so at present pass over Kurrachee. At Gogo, in the Gulf of Cambay, the raised beach is peculiarly conspicuous: the gravels and shells are here cemented into a variety of stone on which I have bestowed the term "Littoral Concrete," from its being always found near the shore, and from its resemblance to the artificial building material called concrete. At Gogo it overlays a huge mass of blue clay. With the interruption occasioned by the Delta of the Taptee, the raised beach, mostly consisting of the material just named, extends all along the shore to Bombay, and so on to the southward; and though I cannot speak from experience of the coast further south than 19°, I have great reason to believe it to be continuous, and feel almost certain that the specimens sent to me from Cochin, by General Cullen, belong to it. The upheaval in all these cases varies from six to nine or fifteen feet above high-water mark, rarely attaining the higher elevation. The same thing prevails around a large portion of the shores of Ceylon.

The Island of Mauritius is belted by an enormous coral reef throughout its whole shore, excepting about ten miles. Between Savanne and Bois-du-Cap the sea foams against a barrier of coral from five to fifteen feet in height, and wears it into the most fantastic shapes. At a considerable distance inland, and almost concealed by the trees and shrubs, are two remarkable points or headlands of coral, from twenty to twenty-five feet above the level of the sea. The Observatory of Port Louis is built upon a stratum of coral ten feet above high-water mark. Blocks

of coral, too vast for being transported by any existing agency, are found from 600 to 1300 feet inland, and which are cut off from the shore by elevated ridges.* The great part of the numberless Coral Islands which are scattered betwixt the Cape of Good Hope and Ceylon—the Chagos Archipelago, the Seychelles, Laccadives, and Maldives, appear to have been elevated to their present level by the same upheaval by which the terraces now under consideration have been produced, of which, I have no doubt, abundance of traces will be found all along the shores of our Eastern Seas. Captain Newbold mentions the abundance of this class of phenomena on the coasts of the Mediterranean, where the shell gravel, as in India, is being cemented into stone. Beaches hardening into stone prevail along the straits of Messina.† Damier speaks of a calcareous deposit in New Holland, consisting of rock, which he thinks must have been formed by the drifting up of sand and shells over a mass of wood, the whole being afterwards consolidated by rain water: this I have no doubt is an instance of the variety of formation, and a proof of the double movement under review;‡ and it seems not improbable that the shell formation of Madagascara belongs to the same class of beds, though of this I cannot speak with confidence.§ The narrow Isthmus connecting the Rock of Gibraltar with the main land is obviously the result of an upheaval, probably of the same age.

Amongst the numberless points where evidences of an upheaval are to be found in Scotland, are the following:—The railway betwixt New Haven and Edinburgh cuts a large bed of shells about twenty-five feet above the level of the sea. A large bed of cockles, obviously in situ, is found at Borrowstoun Ness,|| in the Forth, at about——feet above high-water mark. Cockles live at from 2 to 5 feet below low water. All around the shores of Fife to St. Andrew's, there are beautifully distinct exhibitions of upheaved beaches, several appearing in succes-

* Transactions of the Geological Society—Jamieson's Journal, 1841.

† Jamieson's Journal, Vol. XLIV. Page 63.

‡ Journal of Researches, by Charles Damier.

§ Macaulay.—Jamieson's Journal, 1840. The Madeira Wood is spoken of as being silicified: if so, it must belong to a much more ancient date than the class to be described.

|| McLaren.—Jamieson's Journal for 1850.

sion.* These beaches, which have from St. Andrew's to Ferry point on Craig been covered with drift sand, re-appear along the banks of the Tay—from this westward by Newburgh and Perth. Betwixt Errol and Invergourie Bay on the opposite shore, is a bed of cockles, about three feet above high-water mark, corresponding closely in character with that of Borrowstoun Ness.†

The Arbroath Railway cuts and exposes the shell bed from near Dundee to Broughty Ferry, after which, it is concealed by the sandy Downs. It re-appears to the eastward of Arbroath, and again in Lunar Bay, and to the north and south of Montrose. Beyond this my researches along shore have not extended.

Two beaches are described by Mr. A. Stevenson, off the Ròss of Mull near Skerryvore,‡ on the Frith of Clyde, and probably along much of the low part of the coast to the south.§

The reasons why raised beaches are not at all continuous along our shores, are very obvious. Where the shore was precipitous, and the water deeper at the bottom of the cliff than the whole amount of the upheaval, then, though the bottom of the sea might be raised by so much, and the water become to this extent shallower, there would be no emergence, and the aspect of the coast would then be nearly the same as before—the cliffs having become just so much loftier. Beaches, originally existing, have been swept away where the whole of the material composing them consisted of sand, shells, or gravel, or where they rested on rock liable to decomposition; and the sea in these cases has once more approached its former cliffs or margin. Along the shores of Fife there are beautiful illustrations of beaches well preserved, where the rock was well exposed in a way advantageous for resistance, and of their disappearance, where it was otherwise.

* Chambers's Old Sea Margins.—For the sake of brevity I have been compelled to speak very generally: it is the lowest and most recent of the Sea Margins with which I am dealing.

† Buist's Geological Survey of Perthshire.—Highland Society's Transactions, 1838.

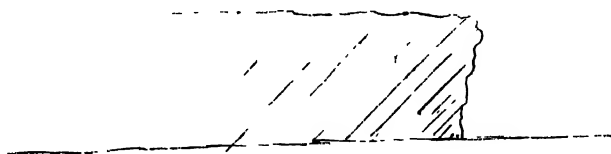
‡ Jamieson's Journal, 1840.

§ Chambers's Old Sea Margins.

Near Crail the rock dips under the sea, and exposes a surface



well suited to withstand the surge, and there accordingly we have extensive raised beaches with the old sea cliffs a considerable way inland. Near St. Andrew's, again, it is the reverse of this. The rock dips away from the sea,



and the upheaved beach has been worn away, the waves now attacking and abrading the old sea cliff. In this, again, ten or twenty feet up the cliff, we have caverns—Lady Buchan's at St. Andrew's, and that of Kinketh to the south, which doubtless opened out on the former beach, and were excavated by the surges of the ancient ocean.

I have rarely met with shell or gravel beaches off the mouths of our great rivers; the deltas or mud deposits have in these cases taken the place of the original beach, or covered or concealed it—or the whole has been eaten away again up to the verge of the purely fresh water deposits by the advance of the ocean. The alluvium of the deltas of our great rivers can only be accounted for on the hypothesis of upheaval. Streams, which run sluggishly, or are partially stagnant, may give us sandbank;—silt, such as that of the Ganges, the Taptee, the Indus, the Nile, &c., is only precipitated when the water in which it is suspended, is permitted *for some time* to remain in a state of absolute repose. Even were it otherwise, the deposit of silt must be restricted to the limits of the inundation, and yet in fact the inundation rarely extends over more than a mere fraction of the true alluvial delta. The same is the case with our carse lands in Scotland—clearly consisting of river-silt, yet of silt which could only have become accumulated and consolidated under water in a state of repose. The level of our delta,

and carse corresponds very closely with that of the most recent of our upheavals, of which I have no doubt they form a part.

I now come to the proofs of a descent having occurred anterior to the upheaval. It is, I think, nearly twenty years since Dr. Fleming described the occurrence of beds of peat, with tree-roots, obviously *in situ*,* both in the estuary of the Tay and the Bay of Lago.

The fangs and fibres of the roots are still entire, and as fast in the ground as when alive: the stumps protrude some distance, through the peat bed. Dr. Fleming seems at this time to have supposed that they were confined to the bed of the river; he does not seem to have been aware that the peat bed was found everywhere under the clay of the low carse, surmounted by from twenty to thirty feet of alluvium. Peat beds of a similar nature are found covered over with a deep layer of alluvium in the valley of the carse, and at Perth. Similar deposits occur at Mount's Bay in Cornwall, in Lincolnshire, and in Orkney. In 1837, in a report drawn up for the Highland Society, on the Geology of the South Eastern portion of Perthshire, I specially adverted to the circumstance of the occurrence of the beds of cockle shells under the silt, and above the peat and tree roots, which seemed to me only capable of being explained on the hypothesis that when the trees grew in the position now occupied by their roots, the surface of the land must have been at least ten feet higher than at present, so as to have placed them above the tide:—that a subsidence of at least twenty feet must have occurred, and that during this period the cockle bed came into existence; and, as the earth continued to descend, became buried in the mud which now covers it to the depth of ten feet:—that the movement must have next changed its direction, raising the cockle bed at least ten feet above its original position, bringing the Carse of Gourie sixteen or twenty feet above the sea, and elevating the tree roots to low water mark.

The phenomena around us at Bombay exactly correspond with those of the Carse of Gourie. The whole of our littoral formations consist of the concretes already referred to, or of loose sand and shells. From three to ten feet under this (the depth varies) is a bed of blue clay,

* The books at our command in India are few in number. I am unable to lay my hands on Dr. Fleming's papers: I quote from Dr. Anderson's account of the Geology of Fife, given in Swan's Review of Fife, Vol. I. page 215.

exactly similar to that with which our estuaries are being silted up. In a great majority of cases the blue clay is filled with the roots of the mangrove—a shrub which only grows within high water mark—avoiding water of more than four or five feet deep. The fangs and fibres of the roots are perfectly entire—some of the thickest of them, indeed, are but imperfectly decayed,—most of them are converted into a substance like peat; and when dried break with a conchoidal fracture and semi-resinous lustre something between jet and lignite. These roots and this arrangement is found to prevail all around the Island of Bombay, on many parts of the Island of Salsette, on the shores of the Gulf of Cambay, and at Kurrachee in Scinde. This state of things is not peculiar to creeks, bays, or estuaries; and can in no way be accounted for by the ponding back of water—it prevails all around the shores of our islands and estuaries into the interior as far as the gravel or concrete beds themselves, and is visible on those portions of our shores exposed to the full force of the ocean. It seems very probable that the New Holland trees described by Mr. Damier, and the Madeira Wood mentioned by Dr. Macaulay, may belong to the same class as the roots I have described, though I have not felt warranted in adducing them as proofs of the hypothesis.

I am satisfied that to this variety of objects the lignite, found near Cochin in lat. 8°, belongs; and that, were our shores examined, it would be found at intervals everywhere along them. In Scotland at Perth, in the Carse of Gourie,* in the corses of Falkirk and Sterling, under the present city of Glasgow, and along the banks of the Clyde, boats and canoes have been dug out from under ten to twenty feet of alluvium, and still ten or twenty feet above the level of high water. Mr. Chambers infers from these things, and I think most conclusively, that the habitation of our island took place before the last thirty or forty feet of its elevation was gained from the ocean. May we not go further than this:—from the relations of these relics of human art to the peat beds and submerged forests around is it not probable that the depression under review was in progress within the human period?

The absence of roots in situ is no proof of a depression never having occurred: at the present moment, for every fifty yards we have mangroves, we have at least 1000 where there are none; and on abrupt,

* Chambers's *Old Sea Margins*, page 19.

sandy, or rocky shores, wherever indeed the locality is unfavorable for the collection of mud and the growth of vegetables, we can have no direct proof of depression.

If, as I have shown, we have the old sea margin of nearly uniform character, aspect, and elevation, presenting itself every where, it is not surely too great a stretch of inference to conclude that the depression was, like the upheaval, not local but general, and that they everywhere accompanied each other.

This theory of double movement completely solves all the mysteries attendant on the formation of coral reefs—the general descent permitted beds of coral of very great thickness to be formed, the ascent brought the whole again to the surface, or above it.

This paper was prepared for the Edinburgh meeting of the British Association. Just after its despatch by the Mail of the 26th July, I found that the meeting of the Association would be long over before it could arrive, and so sent a copy to the Asiatic Society of Bengal. It is necessary to state this and explain the multitude of allusions contained in it to the geology of the East Coast of Scotland—a locality but little known, in all likelihood, to the bulk of the members of the Society.

Aborigines of the North East Frontier.

To The Secretary of the Asiatic Society.

Darjiling, Sept. 16th, 1850.

SIR,—I have the honour to enclose another series of Vocabularies obtained for me, by the Rev. N. Brown of Sibságor, in furtherance of my plan of exhibiting to the Society, a sample of the lingual affinities of all the Aborigines of India, on an uniform plan. The present series comprises four dialects of the Nágá tongue,—the Chútia, the Ahóm, the Khúmti, the Lúos,—and the Siamese. My valuable correspondent Mr. Brown has favoured me with the following remarks, on the present occasion.

“The first four columns of the table complete the variations, priorly given, of the strangely corrupted Nágá language. This tongue affords an extraordinary exemplification of the manner in which an unwritten language may be broken up even upon a small extent of territory. On

the other hand, in the great Tái family we have a not less striking instance of the preservation of a language in almost its original integrity and purity, through many centuries, and in despite of a vast territorial diffusion; for, from Bankók to Sadiyá, along the Meinám, Salwén, Irawádi, and Kyendwen rivers, up to the sources of the Irawádi, through 14 degrees of latitude, there is but one language, notwithstanding the diversity of Governments under which the speakers of it live.

“The Míthan and Tablúng Nágás (see table) reside on the hills east and north of Sibságór. The Kháris descend upon the plains near Jór-hát. They are superior much to the other Nágás. The Jabokas and Banferas are the neighbours of the Mítháns, with nearly similar tongues. The Angámis occupy the southern end of the Nágá country. The Chútia is the language of one of the old tribes of Assam, now nearly extinct. The Ahóm also is nearly extinct as a spoken tongue. The present Ahóms of Assam, descendants of the conquerors, still form one of the largest portions of its population. But their language, as well as their religion, has been relinquished for those of the Hindus. Their ancient creed had little resemblance to Buddhism or to Bráhmañism. The Khámtis retain their tongue but have lost their creed. They have accepted Buddhism from the Burmas, from whom they have likewise borrowed many new words.

“In answer to your queries I can but say, at present, that I highly appreciate the importance of a standard for the Indo-Chinese tongues. But which language has the best claim to be constituted such I do not know. I should be inclined, however, to assume the Burmese, which is at least *half brother to the Tibetan*. This would bring the Tibetan, the Lhópá or Bhútánese, the Burmese, the Singhpho, the Nágá, &c., into a kind of family union. The Siamese Shyán, or, as the people themselves call it, the Tai, cannot be brought into the same category. It has little or no affinity with the neighbouring dialects, and may represent another whole class of languages not yet ascertained. It is probably allied to the Chinese and is in importance not inferior to the Burmese.”

I am, &c.

B. H. HODGSON.

	Mithan Nágá.	Tabling Nágá.	Khar Nágá.	Aqam Nágá.	Deoria chutia.	Ahom.	Khamti.	Laos.	Siamese.
Air	rangbin	wang yak	aning	tikhe	beni,	lóm	lóm	lóm	lóm
Ant	tiksa	tik ha	hungzah	hache	chimechi	nyuchu	mót	mót, puak	mót
Arrow	sán	láhan	takaba	thiwu	átá	lem	lim	lempün	lukson
Bird	ó	óhúá	ozah	pará	duá	nuktú	nók	nók	nók
Blood	ó	th	ai	unhi	chui	let	lüt	leuat	leuat
Boat	khóá	iseng	aróng	ru	nu	ru	hü	heu	reua
Bone	rhá	wan	taret	urá	pichon	tau	nuk	dúk	kaduk
Buffalo	loi	tek	apang	rali	midge	men	khwai	khwai	khwai
Cat	míah	ami	mochi	nunno			miau	meau	meau
Cow	máhu	máhu	masu	mithu	mó-u	hu	ngó	ngó	wóá, ngóá
Crow	okhá	ausapa	waru	chejá	duká	ká	ká	ká	ká
Day	anyi	tini	asonga	tiso	sánjá	bán	wan	wan	wan
Dog	hí	kui	ai	tasu	shi	má	má	má	má
Ear	ná	ná	tenhaun	anye	yáku	pik	hú	hú	hú
Earth	katok	katok	alí	kijé	yá	dín	langmin	dín	phendin
Egg	otí	kek	ansü	podzu	dujá	khrai	khai	khai	khai
Elephant	loák	lok niu	sati	tsu	meu	tyáng	tsang	tsang	chang
Eye	mik	mik	tenik	aunhi	mukuti	tá	tá	tá	tá
Father	apá	opán	tabá	apo	tsipá	po	po	po	po
Fire	van	áh	matu	mi	nye	fai	fai	fai	fai
Fish	ngiá	nyále	anghá	kho	tingá	pá	pá	pá	plá
Flower	maipóá	chupeng	taben	popu	ibá	blok	mok	dok	dokmai
Foot	tchya	yah lan	tachang	uphi	yápasu	tin	tin	tin	tin
Goat	rón	yun	nabóng	fanu	lipeduru	pe	pe	pe	pe
Hair	khó	min, su	kwá	atsu thá	kin	phóm	phóm	phóm	phóm
Hand	chak	yak	takhet	abi	ótun	mü	mü	mü	mü
Head	kháng	sang	telim	atsü	gubong	hó	hó	hó	hóá
Hog	wak	ak	auk	thavo	chu	mü	mü	mü	mü
Horn	róng	wong	tih	pokhye	nu	khau	khau	khau	khau
Horse	man	kowai	kungri	chekwir	gori	má	má	má	má
House	ham	nok	aki	ka	nyá	ren	hün	heun	reuan
Iron	jián	yan	ayin	je	sung	lik	lék	lek	lek

	<i>Mithan</i> <i>Nágá.</i>	<i>Tabung</i> <i>Nágá.</i>	<i>Kharí</i> <i>Nágá.</i>	<i>Angami</i> <i>Nágá.</i>	<i>Deorí-</i> <i>chúia.</i>	<i>Ahom.</i>	<i>Khamti.</i>	<i>Leas.</i>	<i>Siamese.</i>
Leaf	pan chak	phum yak	tuwá	ponye	chiá	bóu	maü	bai	bai
Light	rangai	ning	snaugo	ngakwi	dákari	leug	leng	leng, tseng	sawang
Man	mí	sauniak	ami	theme	móai	kun	kun	khón	khón
Monkey	mainuk	simai	kishá	takwi	iku	laling	ling	ling	ling
Moon	letnu	le	leta	kharr	yáh	den	lun	tawan	tawan
Mother	ánuu	onu	tú	ázo	tsimá	me	me	me	me
Mountain	tun	....	apih	chaju	asü	doi	loi	pukhau	pukhau
Mouth	....	chusim	tabaun	amü	dunju	sup	nói	pák	pák
Musquito	....	'min	mrlá	viru	dán	phreng	yung	yung	yung
Name	man	vang nak	achu	nzá	mu	chu	tsu	tsu	chü
Night	rang nak	vang nak	áyáh	tizi	siri	dam	khün	khün	khün
Oil	manágá	maugá	tutsü	kakiau	tu	man ngá	nam, man	nam, man	nam, man
Plantain	....	....	mangó	tekwasí	tuzu	kui	kue	kue	kue
River	shuá	yang nú	atsü	kharr	ji maji	khe	kye nam	nam me	me nam
Road	lam	lam	ndi	cháah	tsagu	tang	tang	thang	thang
Salt	hum	hum	machi	matse	sün	klu	kü	keu, kem	kleüa
Skin	khóan	soh	tagap	bikhr	chikun	plek	nam	nam	nam
Sky	....	....	aning	thi	pichoni	fá	fá	fá	fá
Snake	pu	pu	ahü	thinhye	dubu	ngó	ngá	ngá	ngá
Star	léthi	cháhá	peti	themü	jiti	dau	hin	dau	dau
Stone	lóng	yóng	alóng	kache	yatiri	frá	hin	hin	hin
Sun	rang hán	wang hí	suhh	sakhi	ságh	bán	wan	kang wan	tawan
Tiger	chianü	sahnü	akhu	mesa	sü	sü	seu	süa	süa
Tooth	vá	phá	tapá	uü	hátí	khü	khü	fan, khiau	fan, khiau
Tree	pan	peh	sundóng	sí	popon	tun	tun	tón	tón
Village	ting	tying	ayim	arame	átigu	bán	ban	ban	ban
Water	ti	riang	atsü	zú	ji	nam	nam	nam	nam
Yam	....	....	....	....	....	....	....	....	....
I	ku	'tau	ní	á	án	kau	man	hoáman	man dóm
Thou	hang	hang	hang	no	no. án	óng, ku	óng, ku	khá	khá
He, she, it	mih	taupá	pau	me	bareni	toa	toa	khon, man	khon, man
We	....	....	akau	awe	járuai	rau	rau	rau	rau

	<i>Mitikan</i> <i>Nágá.</i>	<i>Tablung</i> <i>Nágá.</i>	<i>Khari</i> <i>Nágá.</i>	<i>Angami</i> <i>Nágá.</i>	<i>Deorí</i> <i>chutia.</i>	<i>Ahom.</i>	<i>Khamti.</i>	<i>Leos.</i>	<i>Siamese.</i>
Here	nikó	haki	lobore	u, tinai	phe, thai	ní	ní
There	wadengú ojú	lithe	hobóng	tet	hanpun	....	thi nau
Where?	kuchi	kiraporú	boróng	hó	thai	tinai	thi nai
Above	tamachingu	bale	picho	nu	kan lu	pin	bón
Below	tamókang	chakise	kumo	lep	....	lum	tí
Between	tióng	kite	....	klang	....	....	wang
Without	takigú	kinu	bajúni	bí	....	....	thi nok
Within	tisinge	chikin-i	asain	khanju	tinai	....	thinai
Far	uragu	chawé	butugaiy	jau, sai	kai	....	kli
Near	anhagu	chaguno	butugaiy	klai	kai	....	klai
Little	ichadango	katuno	poiáni	chat	lek, kye	....	leknoi
Much	kwalangau	kyapúr	poiáni	rá	nau	nak, láí	lai, bundá
How much?	kuia	kichuru	ancha	....	....	kilam	ki lem
Thus	itangó	tsawe	lakireni	plai	nang nai	....	yang nan, chen
How?	kotisatú	nokidihika	dakang	....	....	....	thau, phrá het
Why?	chibatsawi	kaji	damno	wá	....	....	phrá aurai
Yes	hau	e	hoi	khewo	tsai	tsai, men	....
No	nongó	mowe	hóya	bukhewo	ma tsai	bo tsai	michi
Not	tá	....	dá	bu, ma	le, tak	bo, mai, yá	mi, yá
And	hawe	....	iu	an nai	le	le, kap, tak
This	pio	....	tailhoni	heu	an nai	ni	ni
That	poicho chu	iwe	bare	an nan	an nan	nan	khondai
Which?	kubai	ki-ru	boroshini	panku	an nai	....	....
What?	chabaú	kaje	damdarini	re	sang	sang	arai
Who?	sui	so-ru	basani	phreu	phai	khai, phai	khrai, süng
Any thing	kuiai	kajipuru	damasirini	....	....	asang	arai
Any body	koi mürh	chakra paru	shámádu	phu	kan phong	....	....
Eat	tsaung	chiliche	harini	kin	kin	kin	kin
Drink	yang ying shi	dzú kretowe	jiniña	kin nam	kin nam	kin nam	deum
Sleep	atsióng	zú	yung arini	non	non, nap	non, lap	lap
Wake	chuushi	zú	harnamani	tung	tun	tun	tun
Laugh	manitli	sirte	batukari	khru	khó	han, khóa	hoaro
	nile	nichi	manitli	nu	batukari	khru	khó	han, khóa	hoaro

	Mithan Nágá.	Tablung Nágá.	Kharí Nágá.	Angami Nágá.	Deoria chutia.	Ahom.	Khamti.	Laos.	Siamese.
Weep	saple	saptike	chipli	krá	ugajñi	hai	hai	hai	rong hai
Be silent	káh	táh	tukurá	chasi bale	turucha	supmu	yú tsip tsip	dak dak yú	ning yú
Speak	râhai	ongkoi	ailushang	pusiche	iechari	bok	wá má	pak má	phut má
Come	tóng	angsi	hinnerang	akiphirche	hangkwá	ká	ká	pai, men	pai
Go	ajong	yong chi	huligili	tatache	ákéná	tí	sau	song	yün
Stand up	ngó dau	um chi	manio	bache	tákarini	nang	nang	nang	dün
Sit, down	tóng, khá	angsi	róng chwa	tothe	dudurini	ká	pai	men	wing pi
Walk	ríkhe	phai chi	semekwa	mabathele	kerurini	paikhan	len	hü	hai
Run	lâhai	yakhu	khiungó	süwawe	larini	au	au	au	au, nap
Give	paule	yakei	hiraugó	khriiwe	larini	au	au	ti, boe	khá, au tai
Take	maithun	set chi	yakchau	vashuwe	borini	dá, po	po	khá	khá, au tai
Strike	langdau	phai chi	yaksitógó	dekhiawe	botechiro	pótai	au tai	sumá	thü
Kill	lâhai	yakei	heneratli	seyawe	larini	ámá	au má	sumá	thü
Bring	lâhai	noi si	heneraugó	satele	laromni	sung	sóng	sóng, thú	yók
Take away	laukó	noi si	chungótó	tupele	lagaromni	yok, tang	yó, yóng	yá	yók
Lift up	athak	chai ha	jaugó	silowe	kanatori	nyin	nyin	rá	dai yin
Hear	avan	tau singpu	metechau	sive	takarini	hü	hü, thom	rú, hú	rú
Understand	.....	.....	.....	.....	.....	bok	wa	wá	bok wá
Tell	maile	mailunke	aró	viwe	churini	dí	ní	dí	dí
Good	manmai	yemei	maró	sowe	chani	khá	maní	hai, bodí	chua, mai dí
Bad	ráng kham	wang sam	aiyang	si	chepepe	khya, náu	yen	náu, yen	yen, náu
Cold	kham	shem	tetsá	kiakwu	kañi	ran, lut	hon	ron	ron
Hot	.....	.....	tachin	memo	pijo	lip	nip	dip	dip
Raw, (green)	jum	yim	tenling	me	munom	oi	suk	suk	wán
Ripe	ti	urang	miang	che	jiri	oi	wán	wán	wán
Sweet	shí	sí	tehsan	khya	siotoi	sum	sóm	sóm	sóm, preo
Sour	khá	khá	kubaitaró	chái	kai	khum	khóm	khóm	khóm
Bitter	.....	.....	maró	visu	ichabare	khyaeng	khóm	khóm	ngám
Handsome	.....	.....	shopur	shokur	üchini	khyaeng	khóm	khóm	ngám
Ugly	.....	.....	mathunjav	thekhá	pune	khyaeng	khóm	khóm	ngám
Straight	.....	.....	tihihang	krewi	kekurais	ú	hai	hai	rái
Crabbed	kom	kom	.....	.....	.....	ke, ngok	ngok	kom, lót	trong, sú

<i>Mithon</i> <i>Nágá.</i>	<i>Tablung</i> <i>Nágá.</i>	<i>Khari</i> <i>Nágá.</i>	<i>Angami</i> <i>Nágá.</i>	<i>Deoria</i> <i>chutia.</i>	<i>Ahóm.</i>	<i>Khamti.</i>	<i>Lach.</i>	<i>Siamese.</i>
Black	niak	nak	kati	sakokoi	dam	nam	dam, nin	dam
White	heng	mesing	kacha	puri	phók	kháu, phúk	kháu, phenk	kháu
Red	....	tamúram	mri	saru	deng	neng	deng, kam	deng
Green	....	shim puluk	kapaje	pijoni	kyi	khyeu	khéau	khéau
Long	lau	tilhaun	jóu	lui	lej au	yáu	yáu	yáu
Long	soh	tútsau	jú	sutugai	lot	lot	san, hun	san
Tall, (high)	tau	oregu	kakhre	suni	sung	sung	sung	sung
Sh-r't, (low)	....	....	khar uo	patigani	tam	tam	tam	tam bôa
Small	'sui	m'ingbaji	kanachapo	suru suroni	nói	lek, on	lek, noi	lek noi
Great	achung, nau	tahpetau	jopür	am chá dñi	lóng	lung, yäü	luang, yai	luang, yai
Round	....	meketang	khruhi	tumóru	kóm	kóm	kóm	kóm
Fat	nittan	tabiti	ponoja	mejirini	pí	pí	pí, tui	sai, man
Thin, (lean)	....	achi	soponoru	dugumjini	heng	yom	....	mai man

*Conspectus of the Ornithology of India, Burma, and the Malayan peninsula, inclusive of Sindh, Asám, Ceylon, and the Nicobar islands.**
—By E. BLYTH, Esq.

Order II. RAPTORES.

Tribe DIURNÆ.†

FAM. FALCONIDÆ.‡

Subfam. FALCONINÆ.

Genus FALCO, L. (as restricted).

A. With longer caudal feathers.§

* Continued from p. 239, *ante*.

† In addition to the obvious external characters which distinguish the diurnal from the nocturnal birds of prey, and the well known differences in the skeleton, the alimentary organs exhibit certain constant differences of structure. Thus the *Diurnæ* have invariably a large crop or dilatation of the œsophagus, and two very minute *cæca coli*; while the *Nocturnæ*, with a wider œsophagus have no dilatation of it whatever, and invariably two considerably developed *cæca*, resembling those of the *Meropidæ*, *Cuculidæ*, *Trogonidæ*, and *Caprimulgidæ*. These distinctions are important as being absolute, presenting no gradation from one type of structure to the other. Prof. McGillivray first brought them adequately into notice.

‡ The Eagle and Falcon family subdivides most naturally, as we conceive, into ten subfamilies, as follows.

1. FALCONINÆ. Comprising the genera *Falco*, *Hypotriorchis*, *Tinnunculus*, *Ieracidea*, *Hierax*,* and *Harpagus* (?)
2. PERNINÆ. *Aviceda*, *Pernis*, *Cymindis*, and *Rostrhamus*.
3. ELANINÆ. *Elanus* (including *Gampsonyx*), *Nauclerus*.
4. CIRCAËTINÆ. *Circæetus*, *Cachinna*, *Hematornus*, *Polyboroides*, *Serpentarius*.
5. CIRCINÆ. *Circus*.
6. ACCIPITRINÆ. *Melēerax*, *Ichnoscelis*,† *Accipiter*, *Micronisus*, *Microstus*, *Astur*.
7. THRASAËTINÆ. *Pseudastur*,‡ *Thrasæetus*, *Morphnus*, *Spizæetus*.
8. AQUILINÆ. *Entolmæetus*, *Aquila*, *Ictinaetus*, *Hieræetus*, *Archibuteo*, *Buteo*, *Poliornis*.
9. HALIAËTINÆ. *Pandion* (?), *Pontooæetus*, *Blagrus*, *Haliaetus*, *Helotarsus*, *Haliastur*, *Milvus*, *Ictinia*.
10. POLYBORINÆ. *Mitrago*, *Polyborus*, *Craxirex*,[§] *Buteogallus*, *Urubitinga*, *Ibycter*, *Daptrius*.

§ This at least is M. Schlegel's arrangement; but we do not think that his *Sacre*, *Lanner*, with the African *F. biarmicus*, and the Australian *F. subniger* and *F. hypoleucos*, and probably others, should rank immediately with the Jer Falcons.

* *Falco semitorquatus*, A. Smith, exemplifies, we conceive, another generic type of pygmy Falcons.

† *Ischnoscelis*, Strickland (1844), is rejected by Mr. G. R. Gray in favor of *Gerano-spiza*, Kaup (1847).

‡ Type, *Falco pacilonotus*, Cuvier, v. *F. scotopterus*, Pr. Max. (Pl. Col. 9).

15. *F. CANDICANS* (?),* Gmelin (*Pl. Enl.* 446).

SYN. *F. groenlandicus*, Brehm, Hancock.

Shangar, Hind.

HAB. Northernmost regions of both continents, visiting the adjacent countries in winter.

Remark. The *Shangar* of eastern works on falconry, stated to be "very rarely met with in India, not more than one or two in a century, and then generally in the Panjab," would seem to be this species, which Dr. Schlegel accepts as distinct from *F. GYRFALCO*, and regards as a permanent variety of it, the *F. ISLANDICUS* of Brehm and Hancock.

16. *F. SACER*, Schlegel (Gould's *B. E.* pl. 20; Hardw. *Ill. Ind. Zool.*)

SYN. *F. lanarius* apud Temminck and Gould.

F. cherrug, Gray.

Cherrag, H.

HAB. Himalaya, very rare; Tahtary; E. Europe.

Remark. I think there can be little if any doubt that this Himalayan (or rather, it would seem, chiefly Tahtarian,) species is the *Sacre Falcon*, as determined by Dr. Schlegel.†

17. *F. LANARIUS* (?), Schlegel, nec Lin., nec Temminck (Hardw. *Ill. Ind. Zool.*, adult; Jerdon's *Ill. Ind. Orn.* pl. 44, young).

SYN. *F. abietinus*, (?), Bechstein.

F. juggur, Gray.

F. luggur, Jerdon.

Juggur Falcon, and probably also *Justin Falcon*, Latham.

Jhaggur, male, *Laggur*, female, Hind; *Laggádú*,

Telegu (Jerdon).‡

HAB. India generally, common; and, if the true Lanner Falcon as determined by Dr. Schlegel, also S. E. Europe, and probably therefore the intervening countries.

* The Italic capitals indicate that the author has examined no Indian example of the species so distinguished.

† Buffon's figure of *le Sacre* (*Hist. des Oiseaux*, pl. 14,) might pass for that of a young *Laggur*, only that the latter has no spots on the outer webs of its tail-feathers, and there is a distinct though small moustache. It probably represents a young *Cherrag*. N. B. The legs of a young *Laggur* are leaden-blue, those of the adult yellow.

‡ The name *Lanner* may possibly be a corruption of *Laggur*.

Remark. This species is very closely affined to the African *F. BIARMICUS*, Tem., to which Mr. Strickland (*in epistola*) refers as synonymes *F. peregrinoides*, Tem., *F. chiqueroides*, Smith, *F. Feldeggi* et *F. lanarius*, Schlegel, *F. rubeus*, Thienemann, and *F. cervicalis*, Kaup. "The only difference I can find," he adds, "between *F. juggur* and *F. biarmicus*, is that the former has the tibial plumes uniform dark brown at all ages, while *F. biarmicus* has them cream-coloured or white, like the rest of the under-parts, with a small brown spot on the centre of each feather." The name *F. biarmicus* occurs in Mr. Vigne's list of birds procured in Kashmir and Little Tibet, *P. Z. S.* 1841, p. 6; and the name *F. peregrinoides* in Mr. G. R. Gray's Catalogue of the birds presented by Mr. Hodgson to the British Museum: but the specimen referred to in the latter instance is not indicated by that name in the same gentleman's second and improved catalogue of the whole collectiōn of *Raptores* in the British Museum. Dr. Schlegel remarks that his *F. lanarius* is closely affined to *F. biarmicus*, "mais elle s'en distingue constamment par les teintes. Il paraît aussi que la première rémige est, proportions gardées, un peu plus longue dans le Lanier que dans l'espèce du Cap."

B. With shorter caudal feathers.

18. *F. PEREGRINUS*, L. (*Pl. Enl.* 421, 430, 469, 470).

SYN. *F. barbarus*, L.

F. gyrfalco, L., *Faun Suec.*, p. 23, No. 64. } apud Schlegel.
F. lanarius, Pennant, *Brit. Zool.* I, 221. • }

F. communis, Brisson.

F. hornoticus et *F. ater*, Gmelin.

F. lunulatus, Daudin.

F. cornicum, Brehm.

F. calidus, Latham (India).

F. puniceus, Lev. (S. Africa), apud G. R. Gray.

F. anatum, Bonap. (N. America).

Bauri, female, *Bauri Batcha*, male. H.; *Raja Wali*, Malay (perhaps the next species); *Sikap Lang*, Sumatra (ditto); *Laki Angin* of the Passummahs (Ditto, Raffles).

HAB. Warm, temperate, and moderately cold climates of both hemispheres; though a plurality of affined races certainly exist: those

of S. Africa are constantly smaller. Common in India, many adults remaining in Lower Bengal during the cold season, and especially frequenting the vicinity of lakes and marshes, to prey on the water-fowl which resort to them; hence they are tolerably numerous in the Bengal *Sundarbans*.

Remark. "India, Europe, and N. America on the one hand, and Cape Horn, the Cape of Good Hope, and Australia on the other," writes Mr. Gould, "are all inhabited by Falcons so nearly allied to each other as to favor the opinion that they are merely varieties of each other; but I agree," he adds, "with the Prince of Canino and Professor Kaup in considering them to be distinct, and representatives of each other, in the respective countries they inhabit." *Introduction to the Birds of Australia.*

We consider the Australian species—*F. MELANOGENYS*, Kaup, (v. *macropus*, Swainson,) to be decidedly distinct from *F. peregrinus*; but strongly suspect that Mr. Gould here refers to the *Sháhin* as the Peregrine Falcon of India. The latter is undoubtedly distinct from *F. peregrinus*; but whether so from *F. melanogenys* is doubtful. Dr. Schlegel would appear to consider these to be the same. Of his *F. communis* (*peregrinus*), he writes—"Il paraît que cette espèce est répartie dans presque toutes les parties du globe, mais qu'elle forme, suivant les contrées qu'elle habite, des races plus ou moins disparates. Les Faucons Communs, par exemple, que produit l'Afrique méridionale, quoique tout-à-fait semblables au nôtre par leur organisation et leurs teintes, sont constamment d'une taille moins forte, la femelle du Faucon Commun du Cap ne surpassant pas en grosseur le mâle de notre Faucon d'Europe. Quant au Faucon Commun de l'Amerique du Nord (voir Wilson, pl. 76, et Audubon, pl. 16), Ch. Bonaparte (List, p. 4.) le sépare du nôtre sous le nom de *Falco anatum*, toutefois sans motiver son opinion. Il paraît en effet que ce Faucon d'Amerique s'éloigne du nôtre par de légères différences dans la distribution des teintes, en ce que ces teintes sont dans le premier, sur les parties supérieures, d'un brun foncé, sur le dessous d'un brun ferrugineux pâle, et que le noir de la tache en moustache s'étend ordinairement sur toute la région des oreilles. Mais il existe également dans l'Amerique du Nord des Faucons que ressemblent parfaitement au nôtre par leurs teintes; j'ai vu un pareil individu dans les galeries du Musée de Berlin. Les Faucons Communs qui viennent du grand Archipel des Indes" (*F.*

peregrinator ?) “et de la Nouvelle Hollande paraissent se rapporter à ceux de l’Amérique du Nord, et n’en différer que par la teinte noirâtre, souvent uniforme des parties supérieures; cette variété a été décrite et figurée par Gould sous le nom de *Falco melanogenys*, dans son ouvrage sur les oiseaux de l’Australie. Nous en possédons six individus dont deux femelles seulement offrent une distribution semblable à celle que nous venons d’indiquer; les quatre autres, tant mâles que femelles, ressemblent parfaitement au Faucon Commun d’Europe. Il me semble, d’après ce que je viens de dire qu’en érigant au rang d’espèces les variétés dont nous venons de parler, il convient également de séparer de notre Faucon la variété à joues noires, qui se trouve en Europe.”

So far as we are aware, the Indian *Bauri* differs in no respect whatever from the Peregrine Falcon of Europe, and has never (so far as we have seen) the wholly black cheeks: but the *Sháhin* has the latter generally and tending so always, and in other respects approximates *F. melanogenys* of Australia; we suspect, however, that it never attains the size of some females of that bird (and also of *F. peregrinus*), and that the colour of its abdominal region is much deeper, while the markings of the entire under-parts of the Australian species (so far as we have seen, and as represented in Gould’s figures,) are more strongly brought out and much broader than in either *F. peregrinus* or *F. peregrinator*. Moreover as the two latter unquestionably distinct (however closely affined) species inhabit India, so there may be a plurality of equally affined species in other countries, very probably affording the solution of the difficulties suggested by Dr. Schlegel.*

19. *F. PEREGRINATOR*, Sundevall (Jerdon’s *Ill. Ind. Orn.* pl. 12, 28).

SYN. *F. shaheen*, Jerdon.

F. sultaneus, Hodgson.

F. ruber indicus, Aldrovandi.

F. melanogenys (?), Kaup.

F. macropus (?), Swainson. } Australia.

* The ordinary haunts of *F. peregrinus* and *F. peregrinator* differ. Thus, Mr. Jerdon (a most experienced observer) remarks—“Whilst the Bhyree (*F. peregrinus*) prefers the sea-coast and the neighbourhood of lakes, rivers, and wet cultivation, and the Shaheen (*F. peregrinator*) delights in hilly and wooded regions, the Juggur, on the contrary, frequents open dry plains, and the vicinity of cultivation.” *Ill. Ind. Orn.*

Sháhin ('Royal'), female; *Koëlá* ('charcoal'), male;
H.; *Jawolum*, Telegu; *Wállúr*, Tamul (Jerdon).

HAB. India generally; chiefly the hilly parts: much more rare in Lower Bengal than *F. peregrinus*; Afghanistan; Malay countries? Australia?

Remark. We have doubtfully cited the names applied to the Australian type, which we are far from satisfied is distinct; although our impression nevertheless is that the latter differs constantly from the Indian *Sháhin* as already indicated.

C. Of feebler conformation.

20. *F. CHICQUERA*, Shaw (Lev. *Ois. d'Afr.*, t. 30, Gould's 'Century,' pl. 2.)

SYN. *F. ruficollis* et *F. macrodactylus*, Swainson.

*F. cirrhatu*s, var., and *Fasciated Falcon*, Latham.

Tarmatti, (*Turumtee*, Jerdon; *Toomtra*, Burnes,) female; *Chetwá*, or *Chetoya*, male; H.

HAB. Asia and Africa; common in India.

Remark. This species is ranged in *Hypotriorchis* by Mr. G. R. Gray. We much prefer to retain it in restricted *Falco*.

Genus *HYPOTRIORCHIS*, Boie.

21. *H. SEVERUS* (*Pl. Col.* 128).

SYN. *Falco severus*, Horsfield.

F. Aldrovandi, Reinwardt.

F. guttatus, G. R. Gray.

F. rufpedoides, Hodgson.

Jhuter (quære *Játá*, 'there goes' or *rushes*), H.;

Allap Allap Gingeng, Jav. (Horsfield).

HAB. Himalaya, Java, Philippines: visiting the plains of Lower Bengal in the cold season, where somewhat rare.

22. *F. SUBBUTEO* (Gould's *B. E.* pl. 22.)

SYN. *Falco subbuteo*, L.

F. barletta, Daudin.

F. pinetarius, Shaw.

F. hirundinum, Brehm.

Karjanna, H. (Hodgson); *Súrkhpushtak* ('rufous-vent') of Kabul (Burnes).

HAB. Europe, Asia, and Africa : visits Lower Bengal in the cold season, where far from common. We have seen it from China.

Remark. This and the preceding species are chiefly seen about and after sunset, and doubtless also therefore about sunrise. A crepuscular tendency which has already been noticed of the Hobby by Capt. Drummond.*

Genus TINNUNCULUS, Vieillot.

23. T. ALAUDARIUS (Gould's *B. E.* pl. 26).

SYN. *Falco alaudarius*, Brisson.

F. tinnunculus, L.

F. fasciatus, Retzius.

F. brunneus, Bechstein.

F. rufescens, Swainson.

F. interstinctus, McClelland.

Cerchneis murum, *C. media*, et *C. tinnuncula*, Brehm.

Gerumatiā, *Gerumatiā*, *Kharum-tiā*,† *Kurrouatia*, *Karontia*, and *Narzi-narzúnak* ('tête á tête'), H.; *Nardunak*, Sindh (Burnes); *Gyo-thin*, Arakan (Phayre); *Allap Allap Sapi*, Jav. (Horsfield); *Raja Alia* (often used as generic for all Hawks), Ceylon (Layard).

HAB. Europe, Asia, and N. Africa : very common in Lower Bengal, where frequently seen in parties of 20 or 30 individuals, beating over the cultivated lands.

Remark. We have seen no Indian Kestrels, that were distinguishable in any way from European specimens in corresponding plumage; but a presumed female from Ye (Tenasserim) is remarkable for the very great breadth of the black markings of its plumage, and may perhaps therefore and probably appertain to a distinct race.

24. T. CENCHRIS (Gould's *B. E.* pl. 27.)

SYN. *Falco cenchris*, Naumann.

F. tinnunculoides et *F. xanthonyx*, Natterer.

* Vide *Ann. Mag. N. H.* 1843, p. 423.

† These names, applied by Buchanan Hamilton to the common Kestrel, properly belong (we suspect) rather to No. 20, and are obviously the same as *Tarmatti* there cited. The term *Gerumatiā*, however, evidently derives from *Gerumati*, orange or ochreous-yellow earth, and is therefore applicable to either.

F. tinnuncularius, Vieillot.

F. Naumannii, Fischer.

F. gracilis, Lesson.

HAB. The warmer parts of Europe and Asia; also N. Africa. In India, found chiefly on the sub-Himalayas, Nilgiris, and other high land; though far from uncommon in Lower Bengal (perhaps in the rainy season only).*

25. T. VESPERTINUS (*Pl. Enl.* 431; Gould's *B. E.* pl. 27.)

SYN. *Falco vespertinus*, L.

F. rufipes, Beseke.

F. subbuteo, var., Latham.

HAB. Europe, Asia, and N. Africa. In India, as the preceding species, to which it is closely affined in all but colour. Both appear to be wholly insectivorous.

Genus HIERAX, Vigors.

26. II. MELANOLEUCOS, Blyth, *J. A. S.* XII, 179 (his).

HAB. Asám.

Remark. We have seen only one specimen of this strongly marked species, which Mr. McClelland received alive from the province named.

27. H. EUTOLMOS, Hodgson.

SYN. *H. bengalensis* apud Blyth, *J. A. S.* XII, 179 (*bis*).

Bengal Falcon, var. A, Latham.

Doung-oo-nhouk, Arakan.

HAB. Nepal, Sylhet, Arakan, Tenasserim provinces.

Remark. Edwards's figure of "the little black and orange Indian Hawk," pl. 108, upon which are founded *Falco caerulescens*, L., and *F. bengalensis*, Brisson, has never been verified by the discovery of a specimen, nor is a *Hierax* known to occur in Bengal; but we nevertheless are of opinion that a peculiar and distinct species is represented by the figure referred to, which may yet be recovered, and the more probably as several species of this genus are now known, and we are acquainted with but a single specimen of *H. melanoleucos*.

* This and the next species we have never observed wild, but certain *shikáris* take many alive with bird-lime, and we have had several newly caught specimens (procured in the immediate vicinity of Calcutta) brought in the course of a few days. They very soon become tame in captivity. The habits of both are doubtless as described in *Ann. Mag. N. H.* 1843, pp. 413, 424.

28. H. FRINGILLARIUS (*Dict. Class. d'Hist. Nat.*, pl. 21 ; *Pl. Col.* 97).

SYN. *Falco fringillarius*, Drapiez.

Hierax malayensis, Strickland.

Malayan *F. cærulescens*, auctorum.

See-ap Belang, Penang ; *Allap*, or *Allap Allap*, Java (Horsfield).

HAB. Tenasserim provinces, Malayan peninsula, and western Indonesia generally ; replaced by other species in the more eastern islands.

Subfam. PERNINÆ.

Genus BAZA, Hodgson.

29. B. LOPHOTES (*Pl. Col.* 10).

SYN. *Falco lophotes*, Temminck.

F. et Lepidogenys Luthami, Gray.

Baza syama, Hodgson.

Lophotes indicus, Lesson.

Syama ('black'), Nepal (Hodgson).

HAB. India generally ; rarer to the south : Ceylon. Not uncommon in the rainy season in Lower Bengal.

30. B. REINWARDTII (Muller, *Aves*, t. 5.)

SYN. *Falco (Lophotes) Reinwardtii*, Muller.

Lophastur Jerdoni, Blyth.

Aviceda sumatrensis, Lafresnaye, *Rev. Zool. par la Soc. Cuv.* 1848, p. 210.

HAB. Malayan peninsula, rare ; Sumatra ; Borneo ; Celebes.

Genus PERNIS, Cuvier.

31. P. CRISTATA, Cuvier (*Pl. Col.* 44 ; Muller, pl. 7).

SYN. *Falco ptilorhynchus*, Temminck.

Buteo cristatus, Vieillot.

P. Elliotti, Jameson.

P. maculosa, *P. torquata*, *P. ruficollis*, et *P. atrogularis*, Lesson.

P. apivora of India, auctorum.

Mádhuva (from *madhu*, 'honey'), Nepal (Hodgson) ;

Shahatela (from *shahad*, 'honey'), H. (Jerdon).

HAB. India generally; Malay countries: not rare in Lower Bengal.

Remark. This averages a rather larger size than the European Pern, with the beak proportionally somewhat larger; but in other respects there is a great similitude in all the many varieties of plumage, except that the Indian bird has an occipital crest more or less developed, sometimes to a length of above $2\frac{1}{4}$ in., though in many this is short or even scarcely traceable.

Subfam. ELANINÆ.

Genus ELANUS, Savigny.

32. E. MELANOPTERUS (Lev., *Ois. d'Afr.*, t. 36; Gould's *B. E.*, pl. 31.)

SYN. *Falco melanopterus*, Daudin.

F. Sonniniensis et *F. vociferus*, Latham.

F. clamosus, Shaw.

E. cæsius, Savigny.

Petite Buse Criarde, Sonnerat.

Kotta Falcon, and (the young) *Indian Falcon*, Latham.

Kápúshi ('cottony'), H.; *Angkal Angkal*, Java (Horsfield).

HAB. S. Asia and its archipelago; S. Europe (rare); and all Africa: common in Lower Bengal, and generally over India.

Remark. Of this genus, one strongly marked species exists in New Holland, in the *E. scriptus* figured in Gould's 'Birds of Australia.' Another of great beauty and even more strikingly distinct, in S. America, the *E. Swainsonii* (v. *Gampsonyx Swainsonii*, Vigors, et *E. torquatus*, Lesson). The other *Elani* of Asia, Africa, and America, are scarcely, even if at all, distinguishable. The diagnosis of the Prince of Canino separating the ordinary Elan of the New World from that of the Old (at least of Java), we have not found to hold good, and the same is remarked by Prof. Schlegel; but he distinguishes the African on the one hand, from the Asiatic and ordinary Australian on the other, referring that sometimes observed in the south of Europe to the former. This naturalist remarks, that "les traits distinctifs des diverses espèces de ce genre n'ont été indiqués jusqu'à présent que d'une manière assez superficielle. L'*Elanion blanc*, qui visite acci-

dentalement l'Europe, quoique sa véritable patrie soit l'Afrique, se distingue constamment de l'*Elanion axillaire*, par sa queue beaucoup plus courte, et par la teinte blanche de la partie interne des ailes; du reste ces deux espèces se ressemblent assez, par rapport au système de coloration.

"L' *Elanus axillaris*, Gould, *B. Austr.*," Vol. I. pl. 23,—"*Falco axillaris*, Lath.,—*Circus axillaris*, Vieillot, *Encycl. Method.* III, p. 1212,—*Elanus notatus*, Gould, *P. Z. S.* 1837, p. 99, 141, qui habite l'Archipel des Indes et la Nouvelle Hollande, s'éloigne du précédent par sa queue plus longue ainsi que par les grandes couvertures internes des ailes qui sont *le plus souvent** d'une teinte noire. Je ne vois pas en quoi se distingue de cette espèce des Indes, celle qui habite l'Amérique, et qui a été indiquée sous les noms suivans : *Falco dispar*, Tem., p. c. 319 (jeune de l'année), Ch. Bonap.,—*Contin. of Wilson*, pl. XI, f. 1; Audubon, pl. 352; *Elanus leucurus*, Bonap., *list*, p. 4."

The Indian Elan has never the black patch on the under surface of the wing represented in Gould's figure of the Australian species, nor is it ever without a distinct trace of this black, in general just indicating the periphery of the marking in the Australian bird. A specimen in immature plumage from the Cape *exactly resembles* the Indian bird of the same age, in proportions as well as colouring.

• Subfam. CIRCAËTINÆ.

Genus CIRCAËTUS, Vieillot.

33. C. GALLICUS (*Pl. Enl.* 413; Gould's *B. E.* pl. 13.)

SYN. *Falco gallicus*, Gmelin.

F. brachydactylus, Temminck.

F. leucopsis, Bechstein.

F. longipes, Wilson.

Accipiter hypoleucos, Pallas.

Aquila leucamphomma, Borkh.

A. pygargus, Brisson.

C. leucopsis et *C. auguium*, Brehm.

Sámp-mánilo ('Snake-killer'), Beng.; *Sámp-mar*
(ditto), H.; *Mulpatu*, Can. (Jerdon).

* The Italics are ours. E. B.

HAB. Europe, Asia, and Africa. Common on the plains of India, preferring an open country and preying chiefly on snakes.

Genus *HÆMATORNIS*, Vigors.

34. *H. CHEELA* (Gould's 'Century,' pl. 1.)

SYN. *Falco cheela*, Latham.

H. undulatus, Vigors.

Circaëtus nipalensis, Hodgson.

H. et Buteo bacha, apud Franklin et Sykes.

F. albidus, Cuv., et *Buteo melanotis*, Jerdon (the young).

F. bacha, Daudin (African race).

F. bido, Horsfield (Malayan race).

Tilái-báj ('spotted Hawk'), B.; *Sabchur* ('full-crested'), ditto, young; *Goomcan Mooryala*, Mahr. (Jerdon); *Doung-tswon*, Arakan (Phayre); *Bido*, Jav. (Horsfield).

HAB. India generally: very common in Lower Bengal; preferring a jungly country, interspersed with tanks and shallow lakes, where it preys much on frogs, which it clutches in the mud. Hence its feet are generally clotted with mud.

Remark. Specimens of this bird from the Malay countries, and also two that we have seen from Ceylon, are rather smaller than those of India and Burma; but we can perceive no other difference. We believe Levaillant is the only author who indicates it from Africa. The Philippine race (*H. spilopterus*, Vigors), is described to be more speckled.

Subfam. CIRCINÆ.

Genus *CIRCUS*, Lacépède.

35. *C. ÆRUGINOSUS* (Gould's *B. E.* pl. 32).

SYN. *Falco æruginosus*, L.

F. rufus, Gmelin.

F. arundinaceus, Bechstein.

Accipiter circus, Pallas.

Circus palustris, Brisson.

C. variegatus, Sykes.

C. rufus, var. *indicus*,—et *C. Sykesi*, Lessou.

Konta Falcon, Muskooroo Falcon, and Rufous-eared Falcon, Latham.

Chóá or *Mát Chil* ('Meadow kite'), Beng. (generic) : *Kutar*, and *Kulehsir* ('capped'), Hind. : *Sufed Sira* ('white-headed'), and *Tiki Bauri* (Hawk with the *tika* frontal mark), *ibid.* (B. Ham.)

HAB. Europe, Asia, and Africa : common in India.

Remark. The adult males of this bird in India have yellow irides, and the wings and tail ash-grey. This phase we have never seen in Europe ; though represented (from an Indian specimen however) in Gould's 'Birds of Europe.'

36. *CIRCUS CYANEUS* (Gould's *B. E.* pl. 33.)

SYN. *F. cyaneus*, *F. pygargus*, et *F. hudsonius*, L.

F. bohemicus, *F. albicans*, *F. griseus*, *F. montanus*, *F. uliginosus*, *F. albidus*, *F. variegatus*, et *F. Buffonii*, Gmelin.

F. cinereus, et *F. rubiginosus*, *It. Poseg.* p. 29.

F. europygistus, Bosc, Daudin.

F. strigiceps et *Circus gallinarius*, Daudin.

Pygargus dispar, Koch.

Tapús, or *Músh-khor* ('Rat-eater'), of Kabul (Bunnes).

HAB. Europe, N. Africa, N. and Middle Asia ; sub-Himalayan territories.

Remark. The American race, *C. uliginosus*, (Gmelin), according to Dr. Schlegel, "se distingue, dans tous les âges, du Busard St. Martin" (*C. cyaneus*) "d'Europe, par des tarses plus élevés. Le vieux mâle a ordinairement toutes les parties inférieures, à partir de la poitrine, ornées des taches nombreuses, soit orbiculaires, soit transversales, d'un brun ferrugineux." Sir W. Jardine, however, could not distinguish some Bermuda specimens from *C. cyaneus* of Europe. Vide *Contrib. Orn.* Neither does Mr. G. R. Gray regard the N. American Harrier as distinct from *C. cyaneus* in his last British Museum Catalogue of *Raptores* (1848).

37. *C. SWAINSONII*, A. Smith. (Gould's *B. E.* pl. 34).

SYN. *C. pallidus*, Sykes.

C. dalmaticus, Ruppell.

C. albescens, Lesson.

Falco æquipar, Cuvier, *M.S.*

Falco cyaneus, var. *A.*, Lesson.

F. herbæcola (?), Tickell.

Dast-Mal ('Hand-soiler'), *H.*; *Tiä* (from the voice),

Derajat (Burnes); *Pandouvi* (Buch. Ham.)

HAB. S. E. Europe, Asia, and Africa: common in India.

Remark. This species is regarded by Dr. Schlegel as merely a local variety of the next, but the two are about equally common in most parts of India in the same localities, and a practised eye distinguishes them readily in any state of plumage. In Lower Bengal, we have found *C. cinerascens* to be the more abundant.

38. **C. CINERASCENS** (Gould's *B. E.* pl. 35).

SYN. *Falco cinerascens* et *cineraceus*, Montagu.

C. Montagui, Vieillot.

HAB. Europe, Asia, and Africa; all India; Ceylon. Common.

39. **C. MELANOLEUCOS** (Pennant's *Indian Zoology*, pl. 2.)

SYN. *Falco melanoleucos*, Pennant.

Pahatü, *H.*; *Ablak Petaha* ('Pied Harrier'), *Petaha*, &c. (probably from the voice), *Hind.*; *Thin-kyä*, Arakan (Phayre).

HAB. India generally, Ceylon, Arakan, Tenasserim provinces.

Remark. The sexes of this bird are alike, and we have never seen the young, or examples in any state of plumage but the fully adult; although this species is common in Lower Bengal.

Subfam. ACCIPITRINÆ.

Genus ACCIPITER, Ray.

40. **A. NISUS**, Pallas (*Pl. Enl.* 467, 412; Gould's *B. E.* pl. 18).

SYN. *Falco nesus*, L.

F. lacteus, Gmelin.

F. nisosimilis, Tickell, *J. A. S.* II, 571.

A. fringillarius, Ray.

A. Dussumieri apud Jerdon, *Madras Journ.* X, 84.

Nisus communis, Cuvier.

N. elegans, *N. fringillarum*, et *N. peregrinus*, Brehm.

Bassun Falcon, Latham.

Búshá,* female; *Búshin*, male; H.

HAB. Europe, Asia, and N. Africa: in India numerous in the hilly parts, rare and accidental on the alluvium of Lower Bengal. *N. B.* We have not seen this species from the eastern side of the Bay of Bengal. It is, however, an inhabitant of Japan.

Remark. The common Sparrow-hawk of N. America, *Acc. fuscus*, (Gm.), v. *F. velox et pennsylvanicus*, Wilson, according to Dr. Schlegel, appears to differ only from that of Europe in being rather less robust, and in the markings on the under-parts of the young assuming the form of tears; and the corresponding species of S. Africa (extending to the N. E. of that continent), *Acc. rufiventris*, A. Smith, v. *F. exilis*, Tem., p. c. 496, et *F. perspicillaris*, Ruppell, according to the same naturalist, seems to differ only from that of Europe in the lower parts of the adult being of a reddish-ferruginous, with the markings a little deeper-coloured and somewhat indistinct.

41. *Æ. NISOIDES*, Blyth, *J. A. S.* XVI. 727.

SYN.? Sumatran *Acc. fringillarius* of the Appendix to Lady Raffles's Memoir of Sir Stamford Raffles, p. 549.

Shikap Ballam (?), Sum. (Raffles).

HAB. Malayan peninsula; Sumatra?

Remark. Mr. G. R. Gray is mistaken in referring this as a synonyme of *Acc. virgatus*, if the latter be truly the Indian *Bázra*, as he arranges it. We rather suspect that the present species is the true *virgatus* of the Malay countries.

42. *A. VIRGATUS*? (Tem. *Pl. Col.* 109, male; Jerdon's *Ill. Ind. Zool.* pl. 4, 29).

SYN. *Falco virgatus*, Temminck, apud G. R. Gray.

A. besra, Jerdon; and the female,

A. fringillarius apud Jerdon, *Catal.*

A. Dussumieri apud Sykes.

Nisus (nec *Sparvius*) *minutus* (?) Lesson.†

* The name *Basha* is however masculine.

† Referred by Dr. Pucheran to "*Nisus soloënsis*" in the *Rev. Zool. par la Soc. Cyp.* 1850, p. 210; a species assigned by him to Sumatra on the authority of Duvaucel, and to the Coromandel Coast and Ceylon on that of Leschenault, which

F. minutus (?), L.

F. Brissonianus (?), Shaw.

Bázra (diminutive of *Báz*, 'Goshawk'), and the male, *Dharti* (a 'handful,' or held in the hand), H. ; *Vaishtapa Dyaga*, Telugu (Jerdon); *Ur chilli, Tamul*, Halapyk caste (Jerdon).

HAB. India generally, but chiefly the hilly parts; also the Malay countries: rare and accidental in Lower Bengal.

Genus MICRONISUS, G. R. Gray.

43. M. BADIUS (Tem. *Pl. Col.* 308, 336).

SYN. *Falco badius*, Gmelin.

F. Brownii, Shaw.

F. Dussumieri, Tem. (nec apud Sykes's or Jerdon's Catalogues).

Accipiter dukhunensis, Sykes.

Nisus malayensis, Meyer.

Calcutta Sparrow-hawk and *Chippuck Falcon*, Latham.

Shikrá (from *Shikárkardan*, to pursue game), female; *Chippak* (or *Chipká*, Jerdon, from the voice), male, H. ; *Thin-kyet*, Arakan (Phayre).

HAB. India generally, Burmese and Malay countries; being very numerous throughout India and in Ceylon: not uncommon in Afghanistan.

Genus ASTUR, Bechstein.

44. A. PALUMBARIUS (*Pl. Enl.* 418, 423, 461; Gould's *B. E.* pl. 17).

SYN. *Falco palumbarius* et *F. gentilis*, L.

F. gallinarius, Gmelin.

F. albescens, Boddaert.

Accipiter astur, Pallas.

Astur gallinarum, Brehm.

Báz or *Báz-Kháni*, female; *Júrrá*, male; H. (*N. B.*

The *Karangosh* is probably a variety.)

HAB. Europe and Asia, rare in N. Africa: in India confined, or nearly so, to the Sub-Himalayas.

leads us to suspect that our No. 42 is intended. As Mr. G. R. Gray classes *F. soloënsis*, Horsf. (v. *F. cuculoides*, Tem.), in *Micronisus*, it cannot well be our No. 41, as formerly suspected.

Remark. The N. American Goshawk, *A. atricapillus*, (Wilson), v. *F. regalis*, Tem. (*Pl. Col.* 495), is regarded by Audubon and lately by Mr. G. R. Gray as identical with the European; but M. M. Temminck and Schlegel consider them distinct, and Sir W. Jardine thus points out the differences observed by him. "The greatest difference," he writes, "between the two birds is in the marking of the breast and under-parts, and is so distinct as to be at once perceived. In the American species, the under-parts are of a uniform pale greyish-white, having the tip and centre of each feather black, forming a dark streak. This extends to those in the centre of the belly, after which it is hardly visible; every feather in addition is clouded with irregular bars of grey. In the European bird, the markings are in the shape of two decided transverse bars on each feather, with the shaft dark, but not exceeding its own breadth,—each, as a whole, having a very different appearance. The upper parts of the American bird are also of a blue shade, and the markings of the head and auriculars are more decided. Wilson's figure is a most correct representation." Dr. Schlegel remarks, that a third closely affined species inhabits Japan.

45. *A. TRIVIRGATUS* (*Pl. Col.* 303).

SYN. *Falco trivirgatus*, Reinwardt.

Astur indicus, Hodgson.

A. palumbarius apud Jerdon, *Catal.*

A. cristatus, G. R. Gray.

Spizaetus rufitinctus, McClelland, *P. Z. S.* 1839, p. 153.

Gar ('fort' or 'mountain') *Bárrá, Mánik* ('esteemed')

Bárrá, Koteswar ('fort-chieftain'), H.; *Churiali* (frequenter peaks) Nepal.*

HAB. India, Burma, and Malay countries; being confined to the hilly parts.

Subfam. THIRASÆTINÆ.

Genus SPIZÆTUS, Vieillot.

46. SP. NIPALENSIS.

SYN. *Nisaetus nipalensis*, crested variety, Hodgson, *J. A. S.* V, 229.

N. pulcher ibid., *J. A. S.* XII, 305.

* There is a great similitude of plumage in the species numbered 42 and 45.

Falco orientalis (?), et *F. lanceolatus* (?), Temminck and Schlegel.

HAB. Himalaya, and mountain ranges north of Sylhet: also mountains of Ceylon, and probably therefore those of S. India.

47. SP. CIRRATUS? (Horsf. Zool. Res. in Java, pl.).

SYN. *Falco cirratus* (?), Gmelin.

F. cristatellus, Temminck.

F. Latham, Tickell.

Nisaetus pallidus, Hodgson, young.

Falco limnaetus, Horsfield.

F. caligatus, Raffles.

F. nireus, Temminck.

Limnaetus Horsfieldi, Vigors.

Nisaetus nipalensis, crestless var., Hodgson, J. A.

S. V, 229.

Lake Falcon, *Bauj Eagle*, and probably *Jermied Eagle*, Latham.

} var.

Sháh-báz or *báj* ('Regal Goshawk'), and *Sadal*, Hind. ;

Lang Tanjbikar, Sum. (Raffles); *Wura Rawa*, Jav.

(Horsfield).

HAB. In two varieties, India generally, Burma, and Indonesia.

Remark. The very common race of Lower Bengal (distinguished above as a variety), occurring also in the Malay countries, and in the sub-Himalayan region, or at least its S. E. portions, has very rarely a developed occipital crest, but in general a mere indication of one, though in one specimen we have seen it 3 inches long. This race also becomes wholly of a sooty-black with age,* save on the base of the remiges underneath, and the tail underneath except towards its tip. The other race, diffused from the sub-Himalayas all over Hindustan, S. India, and Ceylon, has constantly (so far as we have seen) a well developed occipital crest, sometimes attaining to 5½ in. long, and does not appear ever to assume the wholly black plumage, the young also differing in colour from the young of the preceding variety. Nevertheless, after extensive comparison of specimens, we cannot venture to recognise

* Analogous to *Archibuteo lagopus* and *A. sancti Johannis*, though rarely so in the former of these two species (if different, as M. Schlegel contends); also to *Astur melanoleucos* of S. Africa.

these races as specifically distinct. We are unaware that this bird ever exhibits a lengthened crest in the Malay countries.

48. SP. ALBONIGER.

SYN. *Nisaetus alboniger*, Blyth, *J. A. S.* XIV, 173.

HAB. Malayan peninsula (Penang, Malacca).

Remark. Mr. G. R. Gray places this as a variety of the preceding species, to which we cannot give our assent; unless indeed it be considered as a third and very strongly marked Malayan variety, found together with the Bengal variety, and representing the crested race of peninsular India. It is more probably a distinct species, though undoubtedly very closely affined to the preceding one.

49. SP. KIENERI. •

SYN. *Astur Kieneri*, de Sparre.

Spizaetus albogularis, Tickell, Blyth, *J. A. S.* XI, 456.

HAB. Himalaya; C. India.

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Subfam. AQUILINÆ.

GENUS EUTOLMAËTUS, Blyth.

50. EU. BONELLII (*Pl. Col.* 288; Gould's *B. E.* pl. 7; Jerdon's *Ill. Ind. Orn.*, pl. 1).

SYN. *Falco Bonellii*, Temminck.

F. ducalis, Lichtenstein.

Aquila intermedia, Bonelli.

Aq. bifasciata, Vieillot, *Enc. Method.* p. 1192 (apud G. R. Gray).

Nisaetus grandis, Hodgson, *J. A. S.* V, 230.

N. nigrus apud Jerdon, *Catal.*

Genoëse Eagle, Latham.

Moranga, or *Morangi* ('Slayer of Pea-fowl'), Hind.;

Talwa, Telugu; *Rajali*, Tamul (Jerdon).

HAB. S. of Europe and Asia; N. Africa; replaced in S. Africa by the affined *Eu. bellicosus*, (Daudin), v. *Falco arniger*, Shaw. In India and Ceylon, confined to the hilly parts, where far from rare.

Genus AQUILA, Meyer.

51. AQ. CHRYSÆTOS (*Pl. Enl.* 409, 410, Gould's *B. E.* pl. 6).

SYN. *Falco chrysaetos*, *F. fulvus*, *F. melanætos*, et *F. canadensis*, L.

•

F. niger, et *F. americanus*, Gmelin. • •

•

F. melanonotus, Latham.

F. regalis, Temminck *Man. d'Orn.* (1815), p. 10 (nec *Pl. Col.* 495), apud G. R. Gray.

Aquila nobilis, Pallas.

Aq. regia, Lesson.

Aq. melanüetus, Brehm.

Dapheni, E. Himalaya (Hodgson).

HAB. Mountainous regions of the northern temperate zone, including the Himalaya.

52. *Aq. MOGILNIK* (Sav. *Descr. de l'Egypte, Hist. Nat.* I, t. 12; Gould's *B. E.* pl. 5).

SYN. *Falco mogilnik*, Gmelin.

F. ferox, and *Brown-backed Eagle*, Latham.

F. imperialis, Temminck.

Aquila heliaca, Savigny.

Aq. bifasciata, Gray.

Aq. nypalensis, Hodgson, *As. Res.* XVIII, pt. II, 13, pl. 1.

Aq. chrysætos apud Meyer, et Jerdon, *Catal.*

Jumiz, or *Jumbiz*, II.; *Frás*, Beng.; *Won-lo*, Arakan.

HAB. Hill regions of S. E. Europe, Asia, and N. Africa.

53. *Aq. NÆVIOIDES* (Hardwicke, *Ill. Ind. Zool.*)

SYN. *Falco nævioides*, et *F. senegallus*, Cuvier.

F. rapax, Temminck.

F. obsoletus, Lichtenstein (nec Gmelin).

F. choka, A. Smith.

F. albicans, Ruppell.

Aq. fulvescens, *Aq. fulva*, et *Aq. punctata*, Gray.

Aq. vindhiana, Franklin.

Aq. imperialis apud Lesson, *Traité*, p. 97.

Wokháb, also *Jimach* (vide *J. A. S.* XV, 8), H.

HAB. Plains chiefly of India and Africa generally; but not found on the alluvium of Lower Bengal. This small Eagle is remarkable for its habit of preying on the true Falcons!

54. *Aq. NÆVIA* (Savigny, *Descr. de l'Egypte, Hist. Nat., Ois.*, t. 1, et t. 2, f. 1; Gould's *B. E.*, pl. 8).

SYN. *Falco nævius*, *F. maculatus*, et *F. undulatus*, Gmelin.

Aq. melanætos, Savigny.

Aq. clanga, Pallas.

Aq. bifasciata, Hornsch.

Aq. pomarina, Brehm.

Aq. planga et *Spizaëtus fuscus*, Vieillot.

Spotted Eagle, and *Brown-backed Eagle*, var. A, Latham.

Kûljanga, *Bakayâri*, *Jiyadha* (B. Ham.)

HAB. East of Europe, Asia, and N. Africa. Common in the Bengal Sundarbans, and found likewise in Central and S. India.

55. AQ. HASTATA.

SYN. *Morphnus hastatus*, Lesson.

Spizaëtus punctatus, Jerdon.

Limnaëtus unicolor apud Blyth, J. A. S. XII, 128.

Jiyadha, and *Guti-mâr* ('cocoon-destroyer'), H.

HAB. Common in the Bengal Sundarbans, and found likewise in Upper Bengal, and in Central and S. India.

• *Remark.* This and the preceding three species vary greatly in plumage. No. 53 is in structure a miniature of No. 52; No. 54 is larger than No. 53, but less robust; and the present species, with about the same linear dimensions as No. 54, is again of more feeble conformation. A practised eye readily distinguishes either in any phase of colouring.

Genus ICTINAËTUS, Jerdon (nec Kaup).

56. I. MALAIËNSIS (Tem. Pl. Col. 117).

SYN. *Falco malaiënsis*, Reinwardt.

Aquila et *Heteropus* et *Neopus perniger*, Hodgson.

Nisaëtus ? ? *ovivorus*, Jerdon.

Black Eagle, Jerdon, *Catal.*, and *Supp.*

HAB. S. E. Himalaya; Nilgiris; Malay countries.

Genus HIERAËTUS, Kaup.

57. H. PENNATUS (Tem. Pl. Col. 33; Gould's B. E. pl. 9).

SYN. *Falco pennatus*, Gmelin.

F. lagopus, Bengal variety, Latham.

Aquila minuta, Brehm.

Spizaëtus milvoides, Jerdon.

Butaquila strophciata, Hodgson (vide *Calc. Journ. N. H.* VIII, 95).

HAB. E. Europe, Asia, Africa; India generally; Ceylon.

Remark. Prof. Schlegel mentions this bird as of very rare occurrence in Europe and Africa, and that he did not know its proper habitat. It appears to be far from rare throughout India; and the Society's Museum contains a fine series of specimens from the vicinity of Calcutta.

Genus ARCHIBUTEO, Brehm.

58. A. HEMIPTILOPUS, Blyth, *J. A. S.* XV, 1.

SYN. *A. cryptogenys*, Hodgson, *Calc. Journ. Nat. Hist.* VIII, 89, and pl. 5, f. 1.

HAB. Sikim; Tibet.

Genus BUTEO, Cuvier.

59. B. AQUILINUS, Hodgson, Blyth, *J. A. S.* XIV, 176 (March, 1845).

SYN. *B. leucocephalus*, Hodgson, *P. Z. S.* 1845, p. 37 (April).

Falco asiaticus (?), Latham, *Index. Orn.* p. 14.

F. hemilasius (?), Temminck and Schlegel.

B. strophiatius, Hodgson, apud Kaup and G. R. Gray.

HAB. Nepal (G. R. Gray); Tibet; China? Japan?

60. B. PLUMIPES, Hodgson, *P. Z. S.* 1845, p. 37.

SYN. *Circus plumipes*, Hodgson, *Beng. Sp. Mag.* 1836, p. 182;

J. A. S. XV, 2.

HAB. Népal; Tibet.

61. B. RUFINUS (Ruppell, *Zool. Atlas*, t. 27).

SYN. *Circus rufinus*, Ruppell (apud G. R. Gray).

C. et Buteo pectoralis, Vieillot, var.?

B. canescens, Hodgson.

B. longipes, Jerdon.

Nasal Falcon, Latham.

Chuhá Már ('Rat-killer'), H.

HAB. India generally; plains and lower hills. In Lower Bengal, found only above the tideway of the river: also N. Africa.

62. B. VULGARIS, Bechstein (Jerdon's *Ill. Ind. Orn.* pl. 27).

SYN. *Falco buteo*, L.

F. glaucopsis, Merrem.

F. variegatus, *versicolor*, *cinereus*, et *obsoletus*, Gmelin.

F. pojana, Savi.

B. albus, Daudin.

B. mutans et fasciatus, Vieillot.

B. septentrionalis, medius, et murum, Brehm.

B. communis, Cuvier.

B. Swainsonii, Pr. Bonap.

B. montanus, Ruppell.

B. rufiventer, Jerdon.

HAB. Northern hemisphere; rare and to the northward only in America. The loftier hills only in India.

Remark. We doubt if this can in all cases be satisfactorily distinguished from the preceding species, and certainly not some European specimens from some Himalayan or Nilgiri examples.

63. *B. PYGMÆUS*, Blyth, *J. A. S.* XIV, 177.

SYN.? *Astur barbatus*, Eyton, from Malacca (referred by Mr.

G. R. Gray to the Japanese *Falco* or *Poliornis pyrrhogenys*, Temminck and Schlegel).

HAB. Tenasserim provinces; Malayan peninsula!

Remark. This is a true long-winged *Buteo*, though resembling *Poliornis* in some respects; and Mr. Eyton's description sufficiently well applies to it, allowing for some variation of plumage from the Society's specimen. The admeasurements in particular correspond.

Genus POLIORNIS, Kaup.

64. *P. TEESA* (Hardwicke's *Ill. Ind. Zool.*).

SYN. *Circus teesa*, Franklin.

Astur hyder, Sykes.

Zuggun Falcon, Latham.

P. fasciatus (?), A. Hay, *Madr. Journ.* XIII, 146.

Tisa (or *Teesa*, from the voice), H.

HAB. Plains of India, where very abundant: never met with on the mud-soil of Lower Bengal, though appearing immediately this is quitted in a westerly direction: Tenasserim provinces; Malayan peninsula?

Remark. Specimens from Tenasserim and from S. India having large whitish supercilia appear to agree with Lord A. Hay's description of his *P. fasciatus* from Malacca; and the *Astur barbatus*, Eyton, from Malacca, referred to the Japanese *P. (?) pyrrhogenys* by Mr.

G. R. Gray, we have already dubiously assigned to No. 63. The present genus, on mature consideration, we have placed next to *Buteo*, the lengthened cere separating it from the ACCIPITRINÆ among which it is included by Mr. G. R. Gray and others, following Col. Sykes. Major Franklin referred it to *Circus*, and Prof. Kaup regards it as subordinate to *Circæetus*.

Subfam. HALIAËTINÆ.

Genus PANDION, Savigny.

65. P. HALIAËTUS (Gould's *B. E.* pl. 12).

SYN. *Falco haliaëtus*, L.

F. carolinensis, *F. cayanensis*, et *F. arundinaceus*, Gmelin.

F. piscator, Brisson.

Aquila piscatrix, Vieillot.

Aq. balbuzardus, Dumeril.

P. fluvialis, Savigny.

P. americanus, Vieillot.

P. alticeps et *P. planiceps*, Brehm.

P. indicus, Hodgson.

P. ichthyæetus, Kaup (apud G. R. Gray).

Bengal Osprey, Latham.

Mâtch-Morol ('Fish Tyrant'), and *Bulla*, B.; *Mucherera*, H. (Jerdon); also *Mâtch-mángú*, H.:
Won-let, Arakan (Phayre).

HAB. Of general distribution; the Australian race (*P. leucocephalus*, Gould, which according to M. Schlegel is found also in Japan and in the eastern Archipelago), alone slightly differing. Common throughout India, in all suitable localities.

Remark. The Osprey is a very peculiar form among the *Falconidæ*, and wants the projecting super-orbital bone which is so characteristic of (we believe) all the rest. The next genus approximates *Pandion* in the adaptation of structure for piscivorous habits, but is nevertheless very distinct, and much more nearly affined to true *Haliæetus*.

Genus PONTOAËTUS, Kaup.

66. P. ICTHYAËTUS (Horsf., *Zool. Res. in Java*, pl.).

SYN. *Falco ichthyaëtus*, Horsfield.

Haliaëtus plumbeus, Hodgson.

Ichthyætus bicolor, G. R. Gray.

Pandion lineatus (?), Jerdon, young.

Mâtch-morol ('Fish Tyrant'), Beng.; *Madhuya*,
H. (B. Ham.); *Jokomaru*, Java (Horsfield).

HAB. India and Malay countries: common in Lower Bengal.

67. P. HUMILIS (Tem. and Müller, *Ois.* t. 6).

SYN. *Falco* (*Pandion*) *humilis*, Müller.

Ichthyætus nanus, Blyth, *J. A. S.* XI, 202, et XII, 304.

HAB. Malayan peninsula; Sumatra.

Genus *BLAGRUS*, Blyth.

68. B. LEUCOGASTER (*Pl. Col.* 49; Gould's *B. Austr.* Vol. I, pl. 3).

SYN. *Falco leucogaster*, Gmelin.

F. blagrus, Daudin.

F. dimidiatus, Raffles.

F. albicilla, var., Latham.

Ichthyætus cultrunguis, Blyth, the semi-adult.

Haliaëtus sphenurus, Gould, the young.

Kampi-mar Eagle, the semi-adult; and *Maritime Eagle*,
the adult; Latham.

Tampa-mâr ('Snake-killer'), Orissa; *Kohásá*, H.
(Jerdon); *Langlaut*, Sum. (Raffles).

HAB. India; Africa (?); the Malay countries; and Australia.
Tolerably common in Lower Bengal.

GENUS *HALIAE'TUS*, Savigny.

69. H. MACEI (Tem. *Pl. Col.* 8).

SYN. *Falco Macii*, Temminck.

H. albicilla apud Vigors and Horsfield?

H. ossifragus (?) apud Raffles.

H. fulvigaster, Vieillot.

H. albipes, Hodgson.

H. unicolor, Gray, the young (*Hardw. Ill. Ind. Zool.*)

Mâtchéráng, *Mâtch-manggar*, *Korol*, or *Mâtch-korol*
(‘Fish Eagle’), and *Bala*, Beng.; *Kokna*, or *Oogoos*
(Tickell); *Lang-laut*? (Sum.) Raffles.

HAB. Northern India generally; abundant in Lower Bengal;
Malay countries?

Genus HALIASTUR, Selby.

70. H. INDUS (*Pl. Enl.* 416).

SYN. *Falco indus*, Boddaërt.

F. ponticerianus, Gmelin.

Haliaëtus girrenara, Vieillot.

H. garruda, Lesson.

Milvus rotundicaudatus, Hodgson, young.

Shankar Chil ('Shiva's kite), *Dhobia Chil* ('Washer-man's Kite'), and *Ruh-mubárik* ('lucky-faced,' i. e. propitious), Hind. ; *Khemañkari*, Sanskrita ; *Rutta Ookab*, Sindh (Burnes), also *Pilyo* ; *Tswongoung phyoo*, Arakan (Phayre) ; *Lang bondal*, Sum. (Raffles) ; *Ulang*, Java (Horsfield).

HAB. India and Malay countries ; extremely common ; replaced by a nearly affined species in Australia.

Genus MILVUS, Cuvier.

71. M. GOVINDA, Sykes.

SYN. *M. cheele*, Jerdon.

M. melanotis, Temminck.

Haliaëtus lineatus (?), Gray, *Ill. Ind. Zool.*

Chil (from the voice), or *Pariah Chil*, H. ; *Tswon-bop*, Arakan (Phayre).

HAB. S. E. Asia and its islands ; extremely common. In Lower Bengal it disappears during the rainy season.

Remark. The dark-plumaged Kites (*Hydroictinia*, Kaup,) are widely diffused over the Old World and Australia, and among them the African, *M. ægyptius*, (*Falco ægyptius* et *F. Forskali*, Gm., and *F. parasitus*, Daudin,) is well characterized by its yellow beak and some other differences ; but we are not aware in what the Australian (*M. affinis*, Gould), and that of Europe and "temperate Asia" (Schlegel,—*M. niger*, Brisson), differ from that so abundant over all S. E. Asia. Mr. Strickland refers the Indian bird to *M. niger* (of which the synonymes cited by Mr. G. R. Gray are *F. ater*, Gmelin, *F. migrans*, Boddaert, *F. fusco-ater*, Meyer, *F. cinereo-ferrugineus*, Forster, *Accipiter milvus*, Pallas, and *M. fuscus*, Brehm.) We have provisionally followed Mr. Gray and Prof. Kaup in regarding the Indian Kite as distinct from *M. niger*, but greatly suspect that the separation will be found premature, when more extensive series of specimens from the two regions shall have been carefully compared.

PROCEEDINGS
OF THE
ASIATIC SOCIETY OF BENGAL

FOR APRIL, 1850.

The usual monthly meeting of the Asiatic Society was held at the Museum, on Wednesday, the 3rd April, at half past 8 P. M.

The Hon'ble Sir J. W. COLYILE, President, in the chair.

The Proceedings of the former meeting having been read and confirmed, the Secretary stated that Dr. J. McClelland and Capt. Bazeley had intimated their wish to withdraw from the Society.

The following gentlemen, having been regularly proposed and seconded at the March meeting, were balloted for and elected ordinary members of the Society :—

A. J. M. Mills, Esq., B. C. S.

D. T. Morton, Esq., Madras, M. S.

Hon'ble Capt. R. B. Byng.

C. T. Watkins, Esq.

Rev. W. Kay, Bishop's College.

Read letters—

From H. V. Bailey, Esq., Offg. Under Secretary to the Government of Bengal, presenting for the use of the Museum of Economic Geology, a geological Map of the Monghyr district.

From J. Thornton, Esq., Secretary to the Government of the North Western Provinces, forwarding copy of a letter from Lieut. R. Strachey, Bengal Engineers, informing the Society and the public of the nature and extent of his late scientific researches in Kumaon. (Published in the Journal No. I. of 1850).

From F. J. Mouat, Esq., Secretary to the Sub-Committee of Machinery of the General Committee of Industry and Arts, requesting information regarding Miss Tytler's Models.

From Sir Henry Elliot, forwarding a Notice of the 4th volume of Tabary's History, by Dr. A. Sprenger. (Published in the last No. of the Journal).

From James Hume, Esq., Honorary Secretary of the Agri-Horticultural Society of India, transferring some samples of ore forwarded by Capt. J. C. Brooke, Commandant of the Mewar Bheel Corps, from a place called Jáwar, lying midway between Kherwára and Udyapur, together with a note from Dr. Dodd, Assay Master, who states the metal obtained from the ore to be zinc.

From Capt. Newbold, enclosing a paper by Hekekeyan Bey, on the Lead mines of Kohil et Terifel in Egypt.

From Major Wylie, Officiating Secretary to the Government of India, Military Department, transmitting three sheets of the Indian Atlas, received from the Hon'ble Court of Directors.

From Capt. Thomas Hutton, respecting certain Zoological specimens stated to be his property, and which he desires to be kept in deposit for him.

From Dr. E. Roer, Secretary to the Oriental Section, recommending on the part of the Section, the gradual publication of certain Oriental works in the Bibliotheca Indica. Referred to the Section for further consideration.

From Mr. H. Piddington, apologizing for his absence on account of illness, and forwarding an examination of a new Mineral, CALDERITE.

The Librarian having submitted his report, the meeting adjourned.

Read and approved at the meeting of the 1st May, 1850.

WELBY JACKSON, *Vice-President.*

RÁJENDRALÁL MITTRA, *Assistant Secy.*

LIBRARY.

The following books have been received since the last meeting.

PRESENTED.

Tazkerat-ul-kámelín, or Biography of eminent persons. By Rámachandra. Delhi, 1849. 8vo. (Lithograph).—PRESENTED BY SIR HENRY M. ELLIOT, Kt.

Masbáh-ut-tálabín or an Index to the Historians of Mahomedan India. Simlah 1849. 12mo. (Lithograph).—BY THE SAME.

Miftáh-ut-tawárikh, or the Key to History, being a Collection of the most valuable Chronograms in the Persian language. Edited by J. W. Beale. Agra 1849. 4to.—BY THE SAME.

Nouvelles Recherches sur l'Apparition et la Dispersion des Bohémiens en Europe, par Paul Bataillord. Paris, 1849. 8vo. (Pamphlet).—BY THE AUTHOR.

Harivaṁśa, ou Histoire de la famille de Hari, traduit sur la original Sanskrit, par M. A. Langlois. 2nd Livraison. Paris, 1836. 4to.—BY REV. J. WENGER.

Journal of the Indian Archipelago. Vol. IV. No. II.—BY THE EDITOR.

Two copies of the same.—BY THE GOVERNMENT OF BENGAL.

Upadeshaka, No. 40.—BY THE EDITOR.

The Calcutta Christian Observer, for April 1850.—BY THE EDITORS.

The Oriental Baptist, No 40.—BY THE EDITOR.

Trigonometrical Survey Maps, Nos. 69, 70, 89.—BY THE GOVT. OF INDIA.

Meteorological Register kept at the Surveyor General's Office, Calcutta, for the month of February 1850.—BY THE DEPUTY SURVEYOR GENERAL.

Amherst as a Sanatorium. By E. Ryley, Esq. Calcutta, 1850, (Pamphlet). —BY THE AUTHOR.

Tattwabodhini Patrikā, No. 75.—BY THE TATTWABODHINI' SABHA'.

EXCHANGED.

Journal of the Agricultural and Horticultural Society of India. Vol. VII. Part I.

PURCHASED.

The Edinburgh Review. No. 183.

The North British Review. No. 23.

Journal des Savants. For Nov. 1849.

Comptes Rendus. Nos. 19 @ 24.

FOR MAY, 1850.

The usual monthly meeting of the Asiatic Society was held on the 1st of May, 1850.

WELBY JACKSON, Esq., Vice-President, in the chair.

The proceedings of the last meeting were read and confirmed.

Communications were read—

From C. W. Montrou, Esq., Superintendent of the Observatory at Colaba, forwarding a copy of the Magnetical and Meteorological Observations made at that Observatory during the year 1846.

From H. V. Bailey, Esq., Officiating Under Secretary to the Government of Bengal, enclosing copy of a letter addressed to the Military Board, respecting the repairs of the Adinah Masjid.

From C. Gubbins, Esq., C. S., transmitting 12 old copper coins, found in the district of Meerut.

From the Librarian, Bábu Rájendralál Mitra, submitting the subjoined note respecting the coins presented by Mr. Gubbins.

The analogues of these coins have been figured by Mr. Thomas, in his *Patan Coins of India*, figs. 167-8, with which the present specimens agree in rudeness of execution, and in their general appearance. They belong to the period of Sekundar Shah Behlol, who succeeded to the throne of Delhi on the death of his father Behloli Lodi, in 894 A. H., A. C. 1488. The die with which they have been struck having been larger than the coins themselves, it is difficult to decypher the legend, but the comparison of several specimens leaves no doubt on the subject. The coins are of different mintage and dates, and vary in weight from 142 to 148 grams—a difference easily accountable in copper coins nearly four hundred years old. On the obverse, in Mr. Thomas's specimens, the phrase *بحضرت دهلي* follows the word *سلطان*, but no trace of it can be found on the specimens under examination.

Obverse.

۹۱۷, ۹۱۶, ۹۱۵, ۹۰۳ (date) *المتوكل الرحمن سكندر شاه بهلول شاه سلطان*
۹۱۹ (or) ۹۱۸,

Reverse.

في زمن امير المومنين خلدت خلانته

From Dr. E. Roer, Secretary to the Oriental Section, recommending on the part of the Section, that an English translation of the Ch'handogya Upanishad submitted by Bábu Rájendralál Mitra, be printed in the Bibliotheca Indica.

The Oriental Section having neglected to record their opinion on the subject, *ordered*—that it be referred to the Section for their opinion.

A copy of Dr. Hooker's *Rhododendrons of Sikkim-Himálaya* was presented by the Hon'ble the President, on behalf of the author, for which the thanks of the Society were voted.

Read a letter from Dr. O'Shaughnessy, dated the 15th of April, sending his resignation of the office of Secretary to the Society.

To the Hon'ble Sir JAMES COLVILLE.

President to the Asiatic Society.

HON'BLE SIR,—Additional duties having devolved upon me in the Mint, and a trial Electric Telegraph having been ordered—the Construction of which

I have to Superintend; it becomes impracticable for me to continue in charge of the Office of Secretary to the Asiatic Society.

I have therefore to request that you will communicate my resignation to the Council and the Society at large.

In the interval between this and the next meeting I will make every arrangement for clearing off any arrears of business and correspondence, so as to facilitate the duties of my successor, to whom it will afford me great pleasure to give every assistance in my power on his taking charge of the Office.

I have the honor to remain,
Your obedient servant,

W. B. O'SHAUGHNESSY, *V. P. and Secy. As. Soc.*

Calcutta Mint, 15th April, 1850.

It was unanimously resolved, that this meeting, while it receives with regret the resignation of Dr. O'Shaughnessy, desires to express its grateful sense of the valuable services which, as senior Secretary, he has so long rendered to the Asiatic Society of Bengal; and that the Secretary communicate the sentiments of the Society as above expressed to the late Secretary; and that it be published in the Journal.

Read a report of the Council of the Society, recommending the appointment of Capt. F. C. C. Hayes to succeed Dr. O'Shaughnessy as Secretary: the report is as follows:

At a meeting of the Council held on the 19th of April, 1850.

Present.

THE HON'BLE SIR JAMES COLVILLE, *President.*

W. B. JACKSON, Esq. *Vice-President.*

W. SETON KARR, Esq.

S. G. T. HEATLY, Esq.

R. W. G. FRITH, Esq.

BÁBU RAMGOPAL GHOSE.

C. BEADON, Esq.

} *Members.*

The President stated that since the circulation of Dr. O'Shaughnessy's letter of the 15th of April, 1850, he had ascertained that Capt. Fletcher Hayes was willing to be put in nomination for the office of Secretary. Wherefore it was resolved unanimously

That Capt. Fletcher Hayes be proposed by the Council to the next general meeting of the Society for election as Joint Secretary of the Asiatic Society of Bengal in the room of W. B. O'Shaughnessy, Esq., M. D., resigned.

The meeting unanimously approved of the nomination of the Council.

Confirmed, 3rd June, 1850, J. W. COLVILLE, *President.*

FLETCHER HAYES, *Secretary.*

LIBRARY.

The following books have been received since the last meeting.

PRESENTED.

The Rhododendrons of Sikkim-Himálaya, being an account, Botanical and Geographical, of the Rhododendrons recently discovered in the mountains of Eastern Himálaya, from drawings and descriptions made on the spot, during a Government Botanical Mission to that country; by Joseph Dalton Hooker,

R. N. Edited by Sir J. W. Hooker, K. H.—PRESENTED BY THE AUTHOR, THROUGH HON'BLE SIR J. W. COLVILLE.

Notes of a tour in the Plains of India, the Himálaya, and Borneo; being extracts from private letters of Dr. J. D. Hooker. Part II. Calcutta to Darjiling. London 1849, 8vo.—BY THE SAME.

Observations made at the Magnetical and Meteorological Observatory at Bombay; in the year 1846. Printed under the superintendence of A. B. Orlebar, Esq. Bombay 1849. 4to.—BY THE GOVERNMENT OF BOMBAY.

An Historical Account of the Royal Hospital at Greenwich. London 1789. 4to.—BY BÁBU RA'JENDRALA'L MITTRA.

A short Life of the Apostle Paul, in Sanskrit verse. Calcutta 1850. 13mo. (2 copies).—BY J. MUIR, Esq., C. S.

Meteorological Register kept at the Surveyor General's Office, Calcutta, for the month of March 1850.—BY THE DEPUTY SURVEYOR GENERAL.

Tattwabodhini Patriká, No. 81.—BY THE TATTWABODHINI' SABHA'.

Journal of the Indian Archipelago for March 1850.—BY THE EDITOR.

Two copies of the same.—BY THE GOVERNMENT OF BENGAL.

The Oriental Christian Spectator, for February 1850.—BY THE EDITOR.

PURCHASED.

Journal des Savánts for December 1849.

The North British Review, No. 24.

Annals and Magazine of Nat. History for February, 1850.

Comptes Rendus. Tome XXIX. Nos. 25-7.

To the Secretary of the Asiatic Society.

SIR,—I have the honour to present the following report of donations made to the Zoological Department of the Society's Museum during the months of March and April.

1. From Dr. Kelaart, Staff Asst. Surgeon, Newera Elia. A small collection of birds' skins from that locality, comprising several undescribed species.

2. Lt. James, N. I. Selections from a collection of skins of Mammalia and Birds, made in Kunáwar, Kashmir, and Tibet.

3. Bábu Rajendra Mallika. Specimens of *Lemur niger*, Geoffroy, and *Gazella subgutturosa*, female; also carcass of a female Nilgai.

4. Mr. Moxon, of the Pilot Service. Some fine examples of *Larus icthyæetus*, Pallas, and skeleton of this bird and of *Onichoprion anastætus*.

5. Mr. W. Driver. Carcass of an adult female *Hylobates hooleck*.

6. Mr. G. K. Rode. Caterpillar of an *Acherontia*.

7. Mr. Muller. 3 species of Ophidia, from Darjeling.

8. Capt. Sherwill. A few shells from the vicinity of Rajmahal.

9. Capt. Thos. Brodie. Skin with horns of apparently a large female of the animal described by Mr. Hodgson in No. XXXVII. (N. S.) of the Society's Journal, by the name *Budorcas tawicolor*. N. B. Various skins of this species have at various times been presented to the Society, by Major Jenkins, and Capt. E. L. Smith of Sadiya; but only one, a female, in a fit condition to be set up, which has been mounted. I had postponed describing it until I could obtain a perfect skull; and may here remark that I believe its affinities to be strictly *Caprine*, with little relation either to the Bovine group or to the Gnucs (*Catoblepas*), notwithstanding the very remarkable form of the horns.

I have the honour to be, Sir,

Your obedient servant,

E. BLYTH.

Meteorological Register kept at the Surveyor General's Office, Calcutta, for the Month of April, 1850.

Date.	Observations made at Sun-rise.						Maximum Pressure observed at 9h. 50m.						Observations made at apparent noon.					
	Temperature.			Wind.			Temperature.			Wind.			Temperature.			Wind.		
	Bar. red. to 32° F.	Of Mer.	Of Air.	W. Bulb.	Aspect of Sky.	Wind.	Bar. red. to 32° F.	Of Mer.	Of Air.	W. Bulb.	Aspect of Sky.	Wind.	Bar. red. to 32° F.	Of Mer.	Of Air.	W. Bulb.	Aspect of Sky.	Wind.
1	Inches 29.854	77.0	77.5	75.2	Cirro-strati	N. W.	Inches 29.915	87.0	85.9	76.2	S. W.	Cirro-strati	Inches 29.893	91.0	90.4	79.4	S. W.	Cumuli
2	865	73.0	73.3	70.0	Cirro-cumuli	S.	916	86.3	86.8	75.2	S. W.	Ditto	879	93.2	92.7	75.3	S. W.	Cirro-strati
3	922	74.0	74.0	70.0	Cloudy	S. W.	90.015	88.3	88.3	76.2	N. W.	Cirro-cumuli	986	93.3	93.0	73.8	N. E.	Ditto
4	948	78.0	78.5	76.3	Cirro-strati	S. W.	29.971	89.2	88.0	77.5	S. W.	Cirro-strati	937	93.8	93.5	78.0	S. W.	Ditto
5	953	72.0	72.3	69.0	Ditto	N. W.	991	85.8	85.0	73.4	W. N. W.	Ditto	950	95.7	91.3	75.0	S. W.	Ditto
6	957	76.0	76.5	72.3	Ditto	N. W.	30.037	88.7	86.9	72.0	N. N. W.	Clear	960	92.0	91.2	73.9	N. N. W.	Cirro-cumuli
7	987	76.0	76.3	72.3	Clear	N. W.	29.930	90.0	89.4	74.9	W.	Ditto	29.884	94.4	94.4	74.7	N.	Cirro-strati
8	798	78.0	78.5	75.2	Cirro-cumuli	S. W.	837	83.4	82.6	70.2	N. W. sp.	Cloudy	854	86.7	85.5	72.3	N.	Cloudy
9	821	76.1	76.8	73.3	Ditto	S.	870	88.0	87.0	76.7	S. E.	Clear	825	93.1	92.8	76.4	S. W.	Cumuli
10	..	..	..	..	.....	.....	..	..	..	..	..	.....	..	..	..	..	..	.....
11	..	74.7	75.0	74.2	Cloudy	N.	847	86.2	84.5	74.0	S. E.	Cirro-cumuli	810	91.0	90.3	74.6	S. W.	Cirro-cumuli
12	824	72.7	72.9	72.0	Cirro-cumuli	N.	823	86.0	85.2	74.0	S. W.	Clear	779	91.6	93.7	75.3	S. W.	Cumuli
13	807	72.7	72.9	72.0	Cumuli	S.	763	88.8	88.7	79.0	S. W.	Cumuli	708	93.4	98.0	80.6	S. W. sp.	Ditto
14	793	78.9	79.3	76.5	Clear	S.	753	90.8	90.7	81.0	S. W.	Clear	723	96.0	95.7	79.7	W. S. W.	Clear
15	698	80.5	81.0	78.0	Cirro-cumuli	S.	773	87.2	87.7	81.3	S. W.	Cloudy	743	95.0	95.0	78.2	S. W.	Cirro-cumuli
16	700	80.7	81.5	79.4	Ditto	S. W.	825	84.2	84.0	71.2	W. N. W.	Cirro-cumuli	796	99.6	99.0	71.5	N. N. W.	Ditto
17	734	75.9	77.0	74.0	Clear	S. W.	835	92.2	91.8	74.0	S. W.	Ditto	863	98.2	97.4	72.9	S. W.	Ditto
18	879	75.9	76.4	74.0	Cloudy	S. W.	850	90.3	89.8	79.0	S. W.	Clear	854	96.3	96.3	72.9	S. W.	Clear
19	812	79.3	80.2	77.3	Cumuli	S. W.	831	89.3	89.3	77.8	S. W.	Cirro-strati	775	97.4	97.3	75.0	S. W.	Cirro-strati
20	797	77.2	77.7	75.8	Cirro-strati	S. E.	854	88.7	87.7	73.3	S. V.	Cloudy	827	94.0	93.0	73.3	S. W.	Clear
21	801	76.2	76.8	70.8	Ditto	S. W.	898	90.3	89.4	79.0	S. W.	Clear	851	95.2	94.7	77.0	S. W.	Cirro-cumuli
22	880	76.8	77.0	75.4	Cirro-cumuli	S. W.	909	89.0	88.2	76.4	W.	Clear	874	92.3	91.6	76.8	W. N. W.	Clear
23	848	76.9	77.2	72.7	Ditto	S. W.	851	94.2	93.3	75.4	W. N. W.	Cirro-cumuli	862	96.2	94.2	77.2	W.	Cirro-strati
24	768	77.0	76.8	71.3	Cirro-strati	W. N. W.	816	88.7	87.8	72.0	N.	Ditto	801	92.3	90.6	71.0	N. E.	Cloudy
25	767	76.0	76.0	70.6	Cumuli	N. E.	881	84.0	83.3	72.2	E.	Cloudy	809	89.0	87.9	74.6	N. E.	Ditto
26	770	78.3	78.3	70.7	Drizzly	N. E.	831	84.0	83.3	72.2	E.	Rainy	842	79.6	80.0	77.0	S. E.	Rainy
27	674	77.3	77.8	76.3	Rainy	N. E.	857	79.2	79.8	77.7	E.	Cloudy	863	87.8	88.0	76.9	W. S. W.	Cumuli
28	760	77.7	78.1	73.0	Cloudy	W. S. W.	818	85.7	85.3	76.2	W. S. W.	Clear	791	91.8	91.2	80.4	S.	Ditto
29	774	75.0	75.3	73.8	Cumuli	N. W.	824	86.4	86.4	78.4	W.	Clear	728	91.1	90.8	81.3	S.	Ditto
30	730	75.7	80.0	78.3	Scattered clouds.	S.	755	87.3	88.0	80.3	S.	Cumuli	..	..	..	..	..	..
Mean	29.812	77.0	77.2	74.0	.....	.....	29.859	88.1	87.5	76.0	.....	.....	29.896	92.8	92.3	76.1	.....	.....

[Meteorological Register, continued.]

Observations made at 2h. 40m.										Observations made at 4 p. m.										Observations made at sun-set.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
Temperature.			Wind.			Aspect of Sky.	Bar. red. to 32° F.	Temperature.			Wind.			Aspect of Sky.	Bar. red. to 32° F.	Temperature.			Wind.			Aspect of Sky.	Bar. red. to 32° F.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
°	′	″	W. Bulb.	°	′			″	°	′	″	W. Bulb.	°			′	″	°	′	″	°			′	″	W. Bulb.	°	′	″																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
94.0	92.8	78.8	S. W.	Cumuli	29.801	93.9	92.0	78.0	S. W.	Cirro-strati	29.802	97.0	89.3	79.0	S.	Cirro-cumuli	29.803	97.0	89.3	79.0	S. W.	Cirro-strati	29.804	97.0	89.3	79.0	S. W.	Cirro-strati	29.805	97.0	89.3	79.0	S. W.	Cumuli	29.806	97.0	89.3	79.0	S. W.	Cumuli	29.807	97.0	89.3	79.0	S. W.	Cumuli	29.808	97.0	89.3	79.0	S. W.	Cumuli	29.809	97.0	89.3	79.0	S. W.	Cumuli	29.810	97.0	89.3	79.0	S. W.	Cumuli	29.811	97.0	89.3	79.0	S. W.	Cumuli	29.812	97.0	89.3	79.0	S. W.	Cumuli	29.813	97.0	89.3	79.0	S. W.	Cumuli	29.814	97.0	89.3	79.0	S. W.	Cumuli	29.815	97.0	89.3	79.0	S. W.	Cumuli	29.816	97.0	89.3	79.0	S. W.	Cumuli	29.817	97.0	89.3	79.0	S. W.	Cumuli	29.818	97.0	89.3	79.0	S. W.	Cumuli	29.819	97.0	89.3	79.0	S. W.	Cumuli	29.820	97.0	89.3	79.0	S. W.	Cumuli	29.821	97.0	89.3	79.0	S. W.	Cumuli	29.822	97.0	89.3	79.0	S. W.	Cumuli	29.823	97.0	89.3	79.0	S. W.	Cumuli	29.824	97.0	89.3	79.0	S. W.	Cumuli	29.825	97.0	89.3	79.0	S. W.	Cumuli	29.826	97.0	89.3	79.0	S. W.	Cumuli	29.827	97.0	89.3	79.0	S. W.	Cumuli	29.828	97.0	89.3	79.0	S. W.	Cumuli	29.829	97.0	89.3	79.0	S. W.	Cumuli	29.830	97.0	89.3	79.0	S. W.	Cumuli	29.831	97.0	89.3	79.0	S. W.	Cumuli	29.832	97.0	89.3	79.0	S. W.	Cumuli	29.833	97.0	89.3	79.0	S. W.	Cumuli	29.834	97.0	89.3	79.0	S. W.	Cumuli	29.835	97.0	89.3	79.0	S. W.	Cumuli	29.836	97.0	89.3	79.0	S. W.	Cumuli	29.837	97.0	89.3	79.0	S. W.	Cumuli	29.838	97.0	89.3	79.0	S. W.	Cumuli	29.839	97.0	89.3	79.0	S. W.	Cumuli	29.840	97.0	89.3	79.0	S. W.	Cumuli	29.841	97.0	89.3	79.0	S. W.	Cumuli	29.842	97.0	89.3	79.0	S. W.	Cumuli	29.843	97.0	89.3	79.0	S. W.	Cumuli	29.844	97.0	89.3	79.0	S. W.	Cumuli	29.845	97.0	89.3	79.0	S. W.	Cumuli	29.846	97.0	89.3	79.0	S. W.	Cumuli	29.847	97.0	89.3	79.0	S. W.	Cumuli	29.848	97.0	89.3	79.0	S. W.	Cumuli	29.849	97.0	89.3	79.0	S. W.	Cumuli	29.850	97.0	89.3	79.0	S. W.	Cumuli	29.851	97.0	89.3	79.0	S. W.	Cumuli	29.852	97.0	89.3	79.0	S. W.	Cumuli	29.853	97.0	89.3	79.0	S. W.	Cumuli	29.854	97.0	89.3	79.0	S. W.	Cumuli	29.855	97.0	89.3	79.0	S. W.	Cumuli	29.856	97.0	89.3	79.0	S. W.	Cumuli	29.857	97.0	89.3	79.0	S. W.	Cumuli	29.858	97.0	89.3	79.0	S. W.	Cumuli	29.859	97.0	89.3	79.0	S. W.	Cumuli	29.860	97.0	89.3	79.0	S. W.	Cumuli	29.861	97.0	89.3	79.0	S. W.	Cumuli	29.862	97.0	89.3	79.0	S. W.	Cumuli	29.863	97.0	89.3	79.0	S. W.	Cumuli	29.864	97.0	89.3	79.0	S. W.	Cumuli	29.865	97.0	89.3	79.0	S. W.	Cumuli	29.866	97.0	89.3	79.0	S. W.	Cumuli	29.867	97.0	89.3	79.0	S. W.	Cumuli	29.868	97.0	89.3	79.0	S. W.	Cumuli	29.869	97.0	89.3	79.0	S. W.	Cumuli	29.870	97.0	89.3	79.0	S. W.	Cumuli	29.871	97.0	89.3	79.0	S. W.	Cumuli	29.872	97.0	89.3	79.0	S. W.	Cumuli	29.873	97.0	89.3	79.0	S. W.	Cumuli	29.874	97.0	89.3	79.0	S. W.	Cumuli	29.875	97.0	89.3	79.0	S. W.	Cumuli	29.876	97.0	89.3	79.0	S. W.	Cumuli	29.877	97.0	89.3	79.0	S. W.	Cumuli	29.878	97.0	89.3	79.0	S. W.	Cumuli	29.879	97.0	89.3	79.0	S. W.	Cumuli	29.880	97.0	89.3	79.0	S. W.	Cumuli	29.881	97.0	89.3	79.0	S. W.	Cumuli	29.882	97.0	89.3	79.0	S. W.	Cumuli	29.883	97.0	89.3	79.0	S. W.	Cumuli	29.884	97.0	89.3	79.0	S. W.	Cumuli	29.885	97.0	89.3	79.0	S. W.	Cumuli	29.886	97.0	89.3	79.0	S. W.	Cumuli	29.887	97.0	89.3	79.0	S. W.	Cumuli	29.888	97.0	89.3	79.0	S. W.	Cumuli	29.889	97.0	89.3	79.0	S. W.	Cumuli	29.890	97.0	89.3	79.0	S. W.	Cumuli	29.891	97.0	89.3	79.0	S. W.	Cumuli	29.892	97.0	89.3	79.0	S. W.	Cumuli	29.893	97.0	89.3	79.0	S. W.	Cumuli	29.894	97.0	89.3	79.0	S. W.	Cumuli	29.895	97.0	89.3	79.0	S. W.	Cumuli	29.896	97.0	89.3	79.0	S. W.	Cumuli	29.897	97.0	89.3	79.0	S. W.	Cumuli	29.898	97.0	89.3	79.0	S. W.	Cumuli	29.899	97.0	89.3	79.0	S. W.	Cumuli	29.900	97.0	89.3	79.0	S. W.	Cumuli	29.901	97.0	89.3	79.0	S. W.	Cumuli	29.902	97.0	89.3	79.0	S. W.	Cumuli	29.903	97.0	89.3	79.0	S. W.	Cumuli	29.904	97.0	89.3	79.0	S. W.	Cumuli	29.905	97.0	89.3	79.0	S. W.	Cumuli	29.906	97.0	89.3	79.0	S. W.	Cumuli	29.907	97.0	89.3	79.0	S. W.	Cumuli	29.908	97.0	89.3	79.0	S. W.	Cumuli	29.909	97.0	89.3	79.0	S. W.	Cumuli	29.910	97.0	89.3	79.0	S. W.	Cumuli	29.911	97.0	89.3	79.0	S. W.	Cumuli	29.912	97.0	89.3	79.0	S. W.	Cumuli	29.913	97.0	89.3	79.0	S. W.	Cumuli	29.914	97.0	89.3	79.0	S. W.	Cumuli	29.915	97.0	89.3	79.0	S. W.	Cumuli	29.916	97.0	89.3	79.0	S. W.	Cumuli	29.917	97.0	89.3	79.0	S. W.	Cumuli	29.918	97.0	89.3	79.0	S. W.	Cumuli	29.919	97.0	89.3	79.0	S. W.	Cumuli	29.920	97.0	89.3	79.0	S. W.	Cumuli	29.921	97.0	89.3	79.0	S. W.	Cumuli	29.922	97.0	89.3	79.0	S. W.	Cumuli	29.923	97.0	89.3	79.0	S. W.	Cumuli	29.924	97.0	89.3	79.0	S. W.	Cumuli	29.925	97.0	89.3	79.0	S. W.	Cumuli	29.926	97.0	89.3	79.0	S. W.	Cumuli	29.927	97.0	89.3	79.0	S. W.	Cumuli	29.928	97.0	89.3	79.0	S. W.	Cumuli	29.929	97.0	89.3	79.0	S. W.	Cumuli	29.930	97.0	89.3	79.0	S. W.	Cumuli	29.931	97.0	89.3	79.0	S. W.	Cumuli	29.932	97.0	89.3	79.0	S. W.	Cumuli	29.933	97.0	89.3	79.0	S. W.	Cumuli	29.934	97.0	89.3	79.0	S. W.	Cumuli	29.935	97.0	89.3	79.0	S. W.	Cumuli	29.936	97.0	89.3	79.0	S. W.	Cumuli	29.937	97.0	89.3	79.0	S. W.	Cumuli	29.938	97.0	89.3	79.0	S. W.	Cumuli	29.939	97.0	89.3	79.0	S. W.	Cumuli	29.940	97.0	89.3	79.0	S. W.	Cumuli	29.941	97.0	89.3	79.0	S. W.	Cumuli	29.942	97.0	89.3	79.0	S. W.	Cumuli	29.943	97.0	89.3	79.0	S. W.	Cumuli	29.944	97.0	89.3	79.0	S. W.	Cumuli	29.945	97.0	89.3	79.0	S. W.	Cumuli	29.946	97.0	89.3	79.0	S. W.	Cumuli	29.947	97.0	89.3	79.0	S. W.	Cumuli	29.948	97.0	89.3	79.0	S. W.	Cumuli	29.949	97.0	89.3	79.0	S. W.	Cumuli	29.950	97.0	89.3	79.0	S. W.	Cumuli	29.951	97.0	89.3	79.0	S. W.	Cumuli	29.952	97.0	89.3	79.0	S. W.	Cumuli	29.953	97.0	89.3	79.0	S. W.	Cumuli	29.954	97.0	89.3	79.0	S. W.	Cumuli	29.955	97.0	89.3	79.0	S. W.	Cumuli	29.956	97.0	89.3	79.0	S. W.	Cumuli	29.957	97.0	89.3	79.0	S. W.	Cumuli	29.958	97.0	89.3	79.0	S. W.	Cumuli	29.959	97.0	89.3	79.0	S. W.	Cumuli	29.960	97.0	89.3	79.0	S. W.	Cumuli	29.961	97.0	89.3	79.0	S. W.	Cumuli	29.962	97.0	89.3	79.0	S. W.	Cumuli	29.963	97.0	89.3	79.0	S. W.	Cumuli	29.964	97.0	89.3	79.0	S. W.	Cumuli	29.965	97.0	89.3	79.0	S. W.	Cumuli	29.966	97.0	89.3	79.0	S. W.	Cumuli	29.967	97.0	89.3	79.0	S. W.	Cumuli	29.968	97.0	89.3	79.0	S. W.	Cumuli	29.969	97.0	89.3	79.0	S. W.	Cumuli	29.970	97.0	89.3	79.0	S. W.	Cumuli	29.971	97.0	89.3	79.0	S. W.	Cumuli	29.972	97.0	89.3	79.0	S. W.	Cumuli	29.973	97.0	89.3	79.0	S. W.	Cumuli	29.974	97.0	89.3	79.0	S. W.	Cumuli	29.975	97.0	89.3	79.0	S. W.	Cumuli	29.976	97.0	89.3	79.0	S. W.	Cumuli	29.977	97.0	89.3	79.0	S. W.	Cumuli	29.978	97.0	89.3	79.0	S. W.	Cumuli	29.979	97.0	89.3	79.0	S. W.	Cumuli	29.980	97.0	89.3	79.0	S. W.	Cumuli	29.981	97.0	89.3	79.0	S. W.	Cumuli	29.982	97.0	89.3	79.0	S. W.	Cumuli	29.983	97.0	89.3	79.0	S. W.	Cumuli	29.984	97.0	89.3	79.0	S. W.	Cumuli	29.985	97.0	89.3	79.0	S. W.	Cumuli	29.986	97.0	89.3	79.0	S. W.	Cumuli	29.987	97.0	89.3	79.0	S. W.	Cumuli	29.988	97.0	89.3	79.0	S. W.	Cumuli	29.989	97.0	89.3	79.0	S. W.	Cumuli	29.990	97.0	89.3	79.0	S. W.	Cumuli	29.991	97.0	89.3	79.0	S. W.	Cumuli	29.992	97.0	89.3	79.0	S. W.	Cumuli	29.993	97.0	89.3	79.0	S. W.	Cumuli	29.994	97.0	89.3	79.0	S. W.	Cumuli	29.995	97.0	89.3	79.0	S. W.	Cumuli	29.996	97.0	89.3	79.0	S. W.	Cumuli	29.997	97.0	89.3	79.0	S. W.	Cumuli	29.998	97.0	89.3	79.0	S. W.	Cumuli	29.999	97.0	89.3	79.0	S. W.	Cumuli	30.000	97.0	89.3	79.0	S. W.	Cumuli	30.001	97.0	89.3	79.0	S. W.	Cumuli	30.002	97.0	89.3	79.0	S. W.	Cumuli	30.003	97.0	89.3	79.0	S. W.	Cumuli	30.004	97.0	89.3	79.0	S. W.	Cumuli	30.005	97.0	89.3	79.0	S. W.	Cumuli	30.006	97.0	89.3	79.0	S. W.	Cumuli	30.007	97.0	89.3	79.0	S. W.	Cumuli	30.008	97.0	89.3	79.0	S. W.	Cumuli	30.009	97.0	89.3	79.0	S. W.	Cumuli	30.010	97.0	89.3	79.0	S. W.	Cumuli	30.011	97.0	89.3	79.0	S. W.	Cumuli	30.012	97.0	89.3	79.0	S. W.	Cumuli	30.013	97.0	89.3	79.0	S. W.	Cumuli	30.014	97.0	89.3	79.0	S. W.	Cumuli	30.015	97.0	89.3	79.0	S. W.	Cumuli	30.016	97.0	89.3	79.0	S. W.	Cumuli	30.017	97.0	89.3	79.0	S. W.	Cumuli	30.018	97.0	89.3	79.0	S. W.	Cumuli	30.019	97.0	89.3	79.0	S. W.	Cumuli	30.020	97.0	89.3	79.0	S. W.	Cumuli	30.021	97.0	89.3	79.0	S. W.	Cumuli	30.022	97.0	89.3	79.0	S. W.	Cumuli	30.023	97.0	89.3	79.0	S. W.	Cumuli	30.024	97.0	89.3	79.0	S. W.	Cumuli	30.025	97.0	89.3	79.0	S. W.	Cumuli	30.026	97.0	89.3	79.0	S. W.	Cumuli	30.027	97.0	89.3	79.0	S. W.	Cumuli	30.028	97.0	89.3	79.0	S. W.	Cumuli	30.029	97.0	89.3	79.0	S. W.	Cumuli	30.030	97.0	89.3	79.0	S. W.	Cumuli	30.031	97.

JOURNAL OF THE ASIATIC SOCIETY.

No. V.—1850.

A Nineteenth Memoir on the Law of Storms in the Indian and China Seas, being the Cyclones of the SIR HOWARD DOUGLAS and of H. M. Brig JUMNA in the Southern Indian Ocean. January to April, 1848. By HENRY PIDDINGTON, President of Marine Courts.

The Cyclones forming the subject of this Memoir are of special interest, as they occurred in the Storm Tract to which I have so often drawn the attention of navigators in the Eastern Seas, and the documents collected afford us good and tolerable data for the tracks. For the documents of the *Sir Howard Douglas*' Cyclone, I am principally indebted to Capt. Twynham, P. and O. Steam Navigation Company's Agent at Point DeGalle, and to J. Stuart, Esq., of Bombay. But on the other hand it should be stated that though subsequent to the *Jumna*'s Cyclone there were at one time *eighteen* dismasted or cargo-damaged ships lying in the harbour of Port Louis, in the Mauritius, a Captain of one of them who was most zealously desirous of obtaining information for me and applied personally to every one of the Masters, could only obtain one or two Logs! and this is to be the more regretted as this Cyclone it will be seen throws a new light on the science, and is moreover peculiarly instructive for that dangerous tract of the ocean.

PART I.

THE SIR HOWARD DOUGLAS' CYCLONE.

Extract from the Log of the BARQUE ISABELLA BLYTH from Calcutta towards London.—From Capt. H. P. BAYLIS, Ship time.

Thursday, 13th January, 1848.—Noon. The N. W. monsoon experienced the last few days getting very light and variable, as though we should soon lose it. Bar. 29.92; Simp. 29.75; at which they have stood for some days.

Noon.

Lat.	8° 4' south.
Long. by Chron.	89° 07' E.
Do. Lunars	89° 03'.

NO. XLI.—NEW SERIES.

2 z

Friday, 14th January, 1848.—First part light N. W. breeze, shifting suddenly at 5.30 P. M. to east and soon after E. S. E. leading us to hope we had the S. E. trade.

Midnight moderate at east becoming however light and variable. A heavy swell from the westward.

	Bar.	Simp.	Ther.
8 P. M.	29.91	29.76	83.
Noon	29.88	29.75	84.

Noon.

Latitude,..... 9° 22' S.

Long. by Chron. 88° 39' E.

Do. Lunars, 88° 47' .

Course and Dist. S 20 W. 84 miles.

Saturday, 15th January, 1848.—First part light baffling airs with gloomy showery weather settling down about 8 P. M. into the S. E. trade.

A very confused heavy swell from the west meeting a lesser swell from the eastward causing the ship to be very uneasy. *Should think it must have been blowing hard somewhere to the westward.*

	Bar.	Simp.	Ther.
8 P. M.	29.90	29.80	82
Noon,	29.91	29.81	82½

Noon.

Latitude,..... 10° 59' South.

Longitude, 87° 25' East.

Course and Dist. made S. 37 W. 121 miles.

Experienced a current these 24 hours of 37 miles setting S. 79 W.

On the 16th, weather still unsettled and in 12° 38' S.; and 85° 25' east; with a heavy N. W. swell throughout.

In his letter to me Capt. Baylis says, "from the 13th to the 17th January, 1848, a hurricane or severe gale must have been at no very great distance from me as is proved by the circumstance of the *Sir Henry Pottinger* cutting away her foremast in a hurricane on the 14th January in Lat. 9° S; Long. 83° 0' East. I being on the same day in Lat. 9° 22' S.; Long. 88° 39' east; distant from him S. 86° east; 339 miles."

Captain Baylis wrote from London to Liverpool to obtain the Log of this ship and the John Bull* but had no reply from either of the commanders!

Ship WELLESLEY, Capt. ARROW, from Calcutta to England.

Copy of Capt. ARROW's Private Log.

On 10th January, 1848, in 6° 26' S.; Long. 87° 12' E.; Bar. 29.96; Simp. 29.36; Ther. 81°. A long swell from west and westerly breeze.

11th January.—From 10th, Course S. 23° E. 134'; Lat. 8° 29' S.; Long. 88° 14' E.; Bar. 29.94; Simp. 29.30; Ther. 83°. Squally fresh breeze S. W. and fine with a heavy head sea.

* I have obtained no account of what occurred to them.

Wellesley, January, 1848.

	Course and Dist.	Lat.	Long.	Ther.	Bar.	Simp.
12th.	First and middle parts @ S. W. very squally and unsettled W. and high sea from S. ship pitching deep. Latterly increasing to fresh gale @ N. W. with very heavy cross sea both from S. and S. W. heavy lurid appearance and continued heavy rain, making preparations for bad weather.	Per D. R. S. 4° W. 134'	10° 42' 87° 55' 81°		9 A. M. 29.82 3 P. M. 29.68	29.30 29.14
13th	First fresh gale @ N. W. with heavy head sea on and constant rain 4 P. M. drawing @ N. E. with heavy confused and following sea, shipping much water set reefed foresail. Midnight blowing a hard gale @ E. N. E. furlled all but treble reefed main topsail and hove to. Latterly moderate @ E. fine, bore up @ S. S. W. and made some sail.	S. 20° W. 120'	12° 42' 87° 16' 83°		3 P. M. 29.70 29.74 9 A. M. 29.84	29.20 29.20 29.28
14th.	First part out 2nd reefs of courses, steady breeze @ S. E. with high sea and passing showers; 8 P. M. increasing with dirty appearance. In 2nd reefs and reefs of courses, middle blowing fresh at times with squalls and rain and high sea. Latterly moderate S. E. breeze and fine out 2nd reefs of courses. Ship knocking about much and taking much water over all.	S. 37° W. 190'	15° 05' 85° 20' 82°		3 P. M. 29.80 29.94 9 A. M. 29.92	29.20 29.40 29.36
15th.	First part steady fresh breeze @ S. E. with every appearance of the trade, out all reefs. Middle part light with passing showers: latterly strong breeze and cloudy and heavy following sea.	S. 62° W. 214'	16° 45' 82° 04' 81°		29.86 29.98	29.30 29.44

Memorandum on Capt. ARROW's Diagram Chart.

Breeze commenced at S. W. on the 10th and on 11th, at noon was strong and squally at S. W. with head sea, Bar. 29.90; we must have entered into the storm on its N. W. quadrant; Steering south we gradually fell behind it; weather getting worse; and at noon on 12th we were immediately behind it with fresh gale at N. N. W.; and heavy cross sea at S. W. marking where it had passed before: Bar. 29.65; this both from Bar, and the diagram appears to have been our nearest approach; still keeping on S. S. W. course till midnight, when we hove to under treble-reefed main topsail with hard gale at E.N.E. when it got away from us and (at noon) we had on the 13th strong easterly breeze and heavy sea at S. E. Bar. 29.82; we then kept away at S. W. and found the weather rapidly moderating but heavy confused seas on, and at noon on 14th appeared to have got the S. E. trade steady but with high easterly sea. Bar. at 29.90; and rising.

*Abridged Log of the ship Sir HOWARD DOUGLAS, Capt. OGILVY,
from Newport towards Bombay.—Reduced to Civil Time.*

From Noon 13th to Noon 14th January, 1848, the course and distance were North 149' with the wind E. b. S. strong gales and squally. At noon 14th Lat. 14° 18' S.; Long. 80° 49' E.; Bar. 29.54; Ther. 78°. p. m. midnight strong breezes E. S. E. course N. b. E.; double-reefed topsails.

15th Jan.—Close reefing, wind and course as above. Noon strong gales and heavy squalls. Course N. 8° W. 170'; Lat. 11° 30' S.; Long. 80° 24' east; Bar. at 8 a. m. 29.53; Ther. 75°; noon 29.41; Ther. 75°. p. m. wind S. E. course N. N. W., making preparations for bad weather. Bar. 8 p. m. 29.41; Ther. 73°; midnight 29.41; Ther. 70°; position at midnight about 10° 10' S.; 79° 49' east.

16th Jan.—Midnight running to the N. N. W. wind about east, called all hands to heave the ship to. Hurricane came on so quick that the foresail and foretopmast staysail were blown away and the ship broached too. Impossible to go aloft; 1 a. m. a tremendous hurricane. Cargo (of coals) shifted; the sea up to the hatches and breaking over all; Bar. to daylight 29.50; Ther. 72°. Wind is said to have veered from E. b. N. to N. N. E. and N. b. E. and then by the west to southward about noon as well as could be observed. Between midnight and noon lost mizen mast and rudder head, so as to leave nothing but the fore and main masts standing. Ship lying with her gunwale in the water from the shifted cargo. 4 p. m. wind about S. S. W. moderating very rapidly.

Midnight moderate with a very heavy sea. Bar. at 8 a. m. 29.53; noon 29.57; midnight 29.60; Ther. from 73° to 76°.

The Ship VICTORIA, Capt. POTTER, from Calcutta bound to the Mauritius.

Was in about 8° S. Lat. Long. about 80° East when a severe gale commenced p. m. on the 15th January (apparently from the westward). At midnight increasing. At 9½ A. M. a hurricane; lost foretopmast, and main mast, pumps crushed,* 1200 bags of rice thrown overboard, and much other damage done. Barometer about noon 29.47; 29.37, Wind veered from West A. M. to N. W. at noon and to N. N. W. and North. Bar. 29.38 and 29.30. By midnight Bar. had risen to 29.60 and 29.52; and on the 17th weather gradually moderated.

The above is all (that is essential to our purpose) to be deduced from a long account in the newspapers, which, though detailing at length the appearances of the weather and the ship's disasters, does not give positions, wind, courses or distances, or any other data of use to us. We are thus reduced to suppose that she may have been not far from 10° south; and 80° east when close to, but in the rear of the centre, but this is but very vague guessing. The ship being subsequently lost before she returned to Calcutta I was unable to procure her Log.

Abridged Extract from the Log of the Ship ADMIRAL MOORSOM, Capt. T. MCGILL, from England to Colombo. Reduced to Civil Time. Forwarded by Capt. TWYNHAM.

The *Admiral Moorsom* was at noon, 15th January, in Lat. 11° 2' S., (Long. not given but about 79° east,) running to the N. 5. E. with the wind at S. E. and squally, with close threatening weather, the rate of run is not given. 8 p. m. wind gradually veering from S. S. E. to S. S. W. at midnight, being exactly south at 10. Increasing fast throughout.

16th Jan.—At midnight the sky became very black and lowering with constant heavy rain. The Barometer which had been gradually falling all the evening now fell with alarming rapidity,† and the wind had increased to a very heavy gale: kept the ship right before the wind which (A. M.) had veered to S. W. Sea very high. 1 A. M. hove to, all sails blown away. 2 A. M. wind W. S. W. 3, West; violent hurricane from 3 to 5; 4 A. M. wind W. N. W. Sprung bowsprit and lost foretopmast. 5 A. M. wind N. W.; 6, N. W. b. W.; 7, wind N. N. W. 8, N. b. W. 9, North. 10, N. b. E. and at 12, N. E. much abated; by the evening moderate breeze at E. S. E.

* The second instance of this most dangerous accident: See remarks in Fourth Memoir, Journ. Vol. x.

† See remark at the close of the Log.

Remarks.—On the evening before the hurricane the air was exceedingly close, and so hot that it was difficult for any one to remain below in the ship. The Barometer fell gradually all the evening till 1 A. M. it then came down a full half inch in about 45 minutes, but at the same time the hurricane was upon us. It blew with the greatest fury between 3 and 5 o'clock; wind West to N. W. Lowest range of the Barometer 29.03 at 3 P. M. It soon after began to rise as fast as it had previously fallen.

The estimated position of the ship during the height of the hurricane by D. R. from noon of the 15th, was Lat. $9^{\circ} 30' S.$; Long. $79^{\circ} 20'$ east.

Abridged Extract from the Log of the Barque POLLY, JOHN BINNIE Master, from Greenock to Bombay.—Civil Time. From T. SMITH, Esq. Bombay.

On the 14th January 1848—P. M. Steady breeze from S. E., all sail set, increasing towards midnight.

15th Jan.—A. M. a large black cloud in the N. E. quarter with strong *chain* lightning coming out of it.* Bar. falling a little. 4 A. M. strong breeze dark gloomy weather. Bar. stationary from 4 A. M. to 7 A. M. when it commenced falling gradually to noon when making preparations for bad weather. At noon strong gale S. E. with rain. Ship running under double-reefed topsails and courses Lat. by Acct. $10^{\circ} 25' S.$; Long. $79^{\circ} 00'$ East P. M. increasing gale and heavy sea from the S. S. E. Ship running 7 knots to the N. b. E. wind S. S. E. 4.30 P. M. weather looking very wild "atmosphere nearly as black as night." Barometer falling rapidly. 5 P. M. broached to.† Barometer now fell 3 tenths in one quarter of an hour; lying to under bare poles blowing a hurricane, lost foretopmast, ship on her beam ends. During the night appearance of the weather terrific. Barometer at midnight was at the lowest, being then at 27.5 after which began to rise.

16th Jan.—1 A. M. wind N. E. gusts of wind frightful, impossible to hear each other speak to 8 A. M., after which it began to moderate. Noon still blowing a heavy gale. No observation. P. M. moderating. No D. R. is given and no observation was obtained till the 19th when the Lat. was $10^{\circ} 22' S.$; Long. $75^{\circ} 10'$; E. "shewing that the ship had drifted nearly $40'$ West during the hurricane," as she had nothing but calms from that time.

* This was probably the disk of the Cyclone. I do not know what kind of lightning is meant by *chain* lightning.

† Now in about Lat. $9^{\circ} 46' S.$; Long. $79^{\circ} 8'$ East.

Abridged Extract from the Log of the Ship STRABANE, Capt. ANDERSON, from Glasgow to Bombay.—Civil Time. From T. SMITH, Esq. Bombay.

15th Jan.—A. M. light unsteady breezes E. S. E. throughout with sultry weather and a heavy swell from the eastward. Noon Lat. $13^{\circ} 57' S$; Long. $73^{\circ} 11'$ east; Bar. 29.70; Simp. 29.23; Ther. 83 to 96° . P. M. breeze freshened from E. S. E. with at first a clear sky and a heavy swell from the eastward. The sky completely covered with the long white streaks commonly called mares' tails, with diminution of the wind. "The Simpiesometer these three days past fell considerably during the day and rose during the night, but it was much lower than it would have been under ordinary circumstances from the light weather we had. This, with the heavy swell convinced me that it must have been blowing hard not far off, and I mentioned on the 17th, when the gale moderated, to my officers that I did not think we had the worst of it."

16th Jan.—A. M. wind E. S. E. fresh breeze veering southerly to S. S. E. and P. M. to S. S. W.* Dull gloomy sky and rain at times. A confused heavy swell from several directions with heavy rain squalls. Noon Lat. $11^{\circ} 7' S$; Long. $75^{\circ} 10'$ east; Bar. 29.50; Simp. 28.95; Ther. 83° to 85° . P. M. wind S. S. W., West and N. W. frequent squalls from S. S. E. and rain. 6, heavy rain and squalls from South with "occasionally a few tremendous rollers from the eastward besides a heavy swell from the southward;" making preparations for bad weather. At 10 P. M. freshening fast. Midnight a severe gale and rain with fearful squalls. Ship on the port tack standing to the north eastward. Bar. 29.40; Simp. 29.07.

17th Jan.—Furious gale from N. W. with very severe squalls and rain. Noon moderating, wind about North, made a little sail. Lat. $9^{\circ} 20' S$; Long. $74^{\circ} 17'$ east; Bar. 29.55; Simp. 29.00. Ther. 82° to 84° . P. M. to midnight moderating. Bar. at midnight 29.61; Simp 29.26.

The Barque NEW EXPRESS, Capt. BARRETT, from England to Ceylon.

Was on the 15th January, at noon in Lat. $10^{\circ} 14' S$; Long. Chr. $79^{\circ} 2'$ east; Bar 29.85 with a strong breeze from S. E. b. E. and a very heavy sea. P. M. S. E. and at 10 P. M. East, heavy squalls; steering to the N. E. b. N. and N. E.

16th Jan.—Wind east, very heavy sea, and pitching bows under. Noon Lat. $13^{\circ} 18' S$. Long. Chr. $79^{\circ} 45'$ East; Bar. 29.85 P. M. wind East, heavy confused sea, steering to N. N. E and N. b. E.

17th Jan.—1 A. M. wind E. N. E. 4 A. M. moderate. Lat. $12^{\circ} 18' S$; Long. $79^{\circ} 45'$; Bar. 29.90.

* This extract though most carefully made does not give the exact wind at noon. We must therefore take it to have been south, and the lowest depression of the Bar. was after this time, when the ship was crossing in front of the Cyclone and the wind was increasing in strength and veering rapidly as she did so.

Tabular view of the winds and weather at Noon on the 14th, 15th and 16th January, 1848, Sir HOWARD DOUGLAS' Cyclones.

Date.	Name of Ship or Station.	Lat. S.	Long. East.	Winds and Weather.	Bar. Simp.	Ther.	Remarks.
1848. 14th Jan. Noon.	Isabella Blyth.	9° 22'	88° 39'	Light N. E. and E. S. E.	29.88	84°	A heavy swell from the westward.
	Sir H. Douglas.	14° 18'	80° 49'	Strong gales and squally E. b. S. and E. S. E.	29.54	78°	Ship running to the N. b. E. 149' in the 24 h. Midnight double reefs.
15th	Isabella Blyth.	10° 59'	87° 25'	Gloomy showery weather settling at 8 P. M. to the S. E. trade.	29.91	82°	A confused heavy swell from the westward meeting a lesser swell from the east. Suppose it to have been blowing hard to the westward.
	Sir H. Douglas.	11° 30' Midnight 10° 10'	80° 24' 79° 49'	Strong gales and heavy squalls P. M. wind S. E.	8 A. M. 29.53 Noon 29.41 8 P. M. 29.14	75° 75° 73°	Ship running to the N. b. W. and N. W. 17' since noon of 14th. Midnight wind about east.
	Admiral Moorsom.	11° 2'	About 79° 0'	S. E. squally and threatening. 8 P. M. veering from S. S. E. to S. S. W. at midnight.		°	Gale increasing fast throughout.
	Polly.	10° 25'	19° 00'	Increasing gale; noon S. E. P. M. S. S. E.	Midnt. 27.50		A. M. a large black cloud in the N. E. with chain lightning; sea from S. S. E. ship running to the N. b. E. 5 P. M. broached to. Midnight hurricane, lost fore topmast.
							Broached to, in abt. Lat. 9°. 40' S.; Long. 79° 8' east.

Sir HOWARD DOUGLAS' Cyclone.

Date	Name of Ship or Station.	Lat. S.	Long. East.	Winds and Weather.	Bar.	Simp.	Ther.	Remarks.
1848. 15th Jan.	Strabane.	13° 57'	73° 11'	Breeze fresh from E. S. E. and a heavy swell from the Eastward.	29.70	29.23	83.86°	Ship running to the northward,
	New Express.	15° 14'	79° 2'	Strong breeze S. E. b. E. and heavy sea. P. M. S. E. midnight East.	29.85			Ship standing to the N. E. b. N. and N. East,
1850. 16th Jan.	Sir Howard Douglas.			Uncertain from, the distress of the vessel said to be from E. b. N. to N. E.; then by the west and N. W. to southward.	29.50		72°	Ship running to the N. N. W. 1 A. M. overset and cargo of coals shifted, lost mizen-mast, rudder-head, &c. Log uncertain, the Captain having been hurt.
	Admiral Moorsom.	About 9° 30'	79° 20'	Midnight very black and heavy rain, Wind S. W. to West. N. N. W. N. W. N. N. W., North, and at noon N. E.				Position in the height of the hurricane from 3 to 5 A. M. Evening much abated. Sprung bowsprit, lost foretopmast, &c. Fall of the Barometer very sudden. Heavy confused swell from several directions. Making preparations for bad weather
	Strabane.	11° 7'	73° 10'	Dull gloomy wind veering to S. S. E. P. M. to S. S. West and N. W. Midnight severe gale and rain.	29.50	28.95	83.86°	Note.—On 17th, a very severe gale from N. W. Moderating at noon. Lat. 9° 20' N.; Long. 74° 17' east; Bar. 29.55. P. M. heavy confused sea.
	New Express.	13° 18'	79° 45'	East wind and heavy sea.	29.85			

PART II.

THE JUMNA'S CYCLONE.

Abridged Extract from the Log and Admiralty Report of H. M. BRIG JUMNA, Lieut. RODNEY, Commander, from Bombay to England.

I have received from Capt. Fitzgerald, H. M. S. *Vernon*, then senior officer at Bombay, from Lt. Rodney himself, and from friends, copies of public and private reports and accounts of the dismasting of this fine new Brig, which was on her way from the dock-yard at Bombay to England, but they are all singularly deficient in one respect, viz. that they do not give the vessel's run from the 22nd, though one report actually gives every thing in the Logs of 22nd to 24th April, *but* the distances and positions at noon! An omission no doubt of the copyist's but a very vexatious one to us. The position of the vessel at noon 23rd, (and thence at 11 P. M. when she was dismasted) is however given by Lt. Rodney, but for comparisons with other ships the want of the exact positions, from fine weather to fine weather again, is always requisite, as this serves moreover to fix the limits of the Cyclone influence. The italics in the following abridgment are mine.

From Bombay to Lat. $8^{\circ} 59' S.$; Long. $85^{\circ} 34'$ east, which position H. M. Brig reached in ten days from Bombay and at 3 A. M. of the 23rd April 1848, the *Jumna* had the usual fair winds, with heavy squalls thunder and lightning, especially at night. At 3 A. M. it came on to blow from N. West; and at 5^h veered to West; at 6 A. M. to W. N. W.; and at $\frac{1}{2}$ past 3 (force 10) to noon N. N. W.* The Brig in this interval, 3 A. M. to noon 23rd. had run from 9 to 12 knots to the South and S. S. W., mostly S. S. W.; and is placed at noon 23rd April, by Lt. Rodney in Lat. $10^{\circ} 28'$ south; Long. $85^{\circ} 0'$ east. The Barometer having fallen from 29.57 to 29.33. The Ther. 82° and $82\frac{1}{2}^{\circ}$.

At 1 P. M. wind is marked N. b. W. (force 10); at 3, N. N. W.; (force 9) and at 4, calm; by which time the Brig had reached Lat. $11^{\circ} 08' S.$; Long. $84^{\circ} 43'$ east by her Log. the Bar. being now at 29.21 and falling; Ther. 82° ; great numbers of birds apparently much terrified, hanging about the ship, alighting on the deck and rigging, and allowing themselves to be caught without resistance. Blue sky appeared around the horizon with the exception of the N. E. where a

* There is a discrepancy here which should be noted, and is perhaps again an error of the copyist. Lieut. Rodney's Admiralty Report says, "a gale sprung up at 3 A. M. from North veering at times to N. N. W." while his own copy of the Log and two others which I have, give the winds as above stated. All three cannot be wrong we should suppose? I therefore take them as correct.

very heavy bank of clouds hung, *but there was also an indescribable feeling in the atmosphere.*

At half-past 4, the wind is marked as W. S. W. (force 6). At half-past 6, West; at 7, S. W. and W. b. S. (force 10), and S. W. again at 8 p. m. to midnight; force being marked from 10 to 12, but it is said to have been higher than the figures can express, the run at 11^h. and 12^h.; and to 4 a. m. of the 24th is marked at 14 knots. The Bar. at 7 p. m. is at 29.19; at 8 p. m. 29.18; at 9h. 29.16; at 10^h. 29.18; at 11^h. 29.16; and at midnight 29.16: Ther. 81° and 82° throughout. The Brig was hove to at 5.30; but at 3.40 was obliged to bear up, as she heeled over too much to be safe. She was then steered to the N. E. but at 10.45 broached to and went over (about in Lat. 11° 31' S.; Long. 84° 54' east) and the mainmast was cut away to right her. After this she continued running, under the foremast only, at the rate of 14 or 15 knots till 4 a. m. when the gale moderated very rapidly, the vessel being by noon 24th April in Lat. 10° 14'; Long. 85° 50' by Lt. R. The Bar. rose from 29.16 at midnight to 29.42, at noon.*

Abridged Log of the Ship SULTANY, Capt. H. H. HANDLEY, from Mauritius to Calcutta.—Reduced to Civil Time.

21st April, 1848.—Two days previous to this date the wind was varying from North to N. E. with a threatening appearance and a heavy swell from N. N. E. with the Barometer gradually falling. Noon in Lat. 8° 15' S.; Long. 86° 22' E.; Bar. 29.75. Reducing sail and preparing for bad weather. Wind North; p. m., N. N. E. at 4: N. E. at 6; and N. N. E. at 10 p. m. to midnight; ship running 6½ knots to the W. S. W. At 10 p. m. under a close reefed fore-topsail, gale blowing furiously.

22nd April, 7 a. m. Bar. 29.61. Securing everything for a gale. Noon Lat. 9 24' S.; Long. 84° 35' East; Bar. 29.63; Ther. 83°. Wind N. E. from 4 a. m.; p. m. N. E. increasing; and at 3 p. m. hove to under close reefed main topsail. Bar. at 2h. 30' p. m. 29.35; 4h. p. m. 29.12; at 5h. 29.8; 6h. 29.10; 7h. 29.12; to p. m. 29.15; 6 p. m. wind N. E. to 9h. p. m. when North with furious squalls: at midnight N. E.

23rd April, a. m. Blowing a hurricane from N. E. ship lying with her lee gunwale in the water, towards noon wind all round the compass, with a dreadful sea and thick dense atmosphere. Noon Bar. 29.16. No observations. Lat. by Acct. 9° 32' S.; Long. 83° 37' east; Ther. 83°. p. m. wind marked S. W. Set close reefed mizen topsail and reefed foresail and ran 10 miles north; but at

* A complete Log is given in the Remarks explaining the singular track of this Cyclone.

3 P. M. the gale increasing hove to again. Bar. 29.12 at 6 P. M.; at 7h. 29.15; at 8h. 29.20; 11 P. M. wind West, impossible to blow harder; 11^h. 29.26; midnight Bar. 29.28. From 8 to 10 P. M. vivid lightning with a remarkable red appearance to the S. E. throughout the night.

24th April.—Gale abating. 3 A. M. Bar. 29.27. Wind West at noon, found 4 feet water in the well, sea going down. Noon Lat. Obs. 9° 21' N.; Long. 85° 8' East by Indiff. observations; Bar. 29.64; Ther. 83° $\frac{1}{2}$. After which fine weather. Ship by Chr. on this day was 29' east of Acct. estimating her drift at 3' per hour throughout.

From the Mauricien of May 24th, 1848, we have the following notices:—

The bark *Samarang* experienced on the 21st April, in Lat. 9° 44' S.; and Long. 72° E.; a hurricane that lasted 40 hours, wind from N. E. to S. W. Barometer fell to 28.20, bulwarks carried away, sails split, etc.

The *Mary Stoddart* experienced on the 22nd and 23rd April, in Lat. 10° 30' S.; and Long. 86° 50' E., a severe hurricane, wind from N. E. to S. W. Barometer 29.10, bulwarks carried away, stern dead lights stove in, and washed away the starboard cabin, rudder damaged; put into this port for repairs.

On the 23rd April, in Lat. 9° 18' S.; and Long. 84° E.; the *Pemberton* experienced a hurricane; wind from N. N. W. to West and W. S. W., vessel sprung a leak and lost the head of her rudder, and caused her to put in for repairs; threw overboard about 1000 bales cotton.

On the 23rd of April, the *Brig Deborah* being in Lat. 9° 19' South; Long. 82° 50' East, experienced a severe hurricane from N. E. to S. W., which laid the ship on her beam-ends for some time, the sea very heavy and the ship straining much. It commenced at 6 o'clock A. M. and blew severely till half past 10 A. M.—*Le Mauricien*, May 24th, 1848.

The following is from some imperfect notes by a Civilian passenger, MR. MELDRUM, Professor in the College at Bombay, on board the ship PEMBERTON from Bombay to the Mauritius; which have been kindly forwarded by Dr. BUIST from that gentleman.

This vessel was without either Barometer or Simpiesometer; the Barometer having been broken "the Captain did not think it at all important to have it repaired!" And it will be seen that the ship's position is recorded on two days only, once at noon and once near the centre of the Cyclone, which last is however very important.

Thursday, 20th April, 1848.—Wind to-day from N., sky still dark and gloomy with heavy cumuli; Lat. 6° 31' 10" S.; Long. 83° E.; a heavy squall about 6 o'clock.

Friday, 21st April.—Sky lowering, wind shifting about ; but it is almost calm, very gloomy, no observation ; in the evening dead calm, soon after cleared up a little towards S., and a light breeze sprung up from S. W. ; about midnight wind increased and blew pretty hard ; flocks of sea birds.

Saturday, 22nd April.—Strong gale from N. by E., sky pretty clear towards horizon, wind shifting from N. by E. towards S. and S. by W. with great violence, rudder damaged by a heavy sea ; sea raging, much rain ; Lat. $9^{\circ} 41' 17''$ S. ; Long $83^{\circ} 55'$ east ; about midnight weather moderated but sea ran tremendously high.

Sunday, 23rd April.—At 4 A. M. wind got up again and blew from S. by W. with greater violence. By noon, it was at its height, bulwarks driven in (the top gallant masts had been housed) scrambled on deck, clouds tattered, meeting with the spray, lower strata appear to move in a direction contrary to the upper, perhaps owing to their difference in velocity. After some hours the wind began gradually to abate and shift towards S. and S. E. By 6 o'clock it was pretty quiet, sea running very high.

Abridged Log of the Ship SAMARANG, Capt. BUCKLE, from Calcutta to the Mauritius.—Reduced to Civil Time.

21st April.—At noon in Lat. $8^{\circ} 76'$ S. ; Long. $86^{\circ} 14'$ east ; wind N. E. b. N. Increasing breeze and squally ; course S. W. 8 knots. Bar. 29.79 ; Ther. 83° . P. M. wind N. E. b. E. course as before to midnight. At 10 P. M. moderating but Barometer (which is registered every hour) falling from 29.79 : at 1 P. M. to 29.68 at midnight, when squally with rain.

22nd April.—A. M. increasing with hard squalls ; wind N. E. b. E., course as before ; 7 A. M. 8 knots to the S. W. *Day light more moderate again.* At 10 A. M. increasing to a gale. Preparing for bad weather. Bar. falling from 29.67 at 1 A. M. to 29.52 at noon, when wind about E. N. E. a gale. No observations Lat. Act. $10^{\circ} 27'$ S. ; Long. $83^{\circ} 34'$ East. Fresh gale and high sea. P. M. wind E. b. N. Gale increasing, hove to at 1 P. M. 6 P. M. wind E. N. E. ; 10 P. M. East ; at 8, increasing to a hurricane. Bar. falling from 29.52 at 1 P. M. to 29.39 at 6 P. M. ; rising to 29.45 at 8h. and falling again to 29.39 to midnight.

23rd April.—A. M. hurricane still increasing, wind S. E., sea tremendous. 3 A. M. blowing with terrible fury, hove 300 bags of rice overboard. At 4, ship easier but hurricane still raging. All hands at the pumps for many hours. At 8, wind South, squalls not so heavy. Noon hurricane more moderate. Bar. from 29.39 at 1 A. M. to 29.50 at noon ; Ther. 76° ; Lat. Acct. $10^{\circ} 32'$ S. ; Long. $82^{\circ} 10'$ east. Wind South decreasing ; 3 P. M. S. S. W. 8 P. M. West. Bar. from 29.48 at 1 P. M. to 29.62 at midnight with the gale constantly decreasing.

24th April.—A. M. wind S. S. W. ; at 6 A. M. S. b. W. ; Bar. from 29.62 at 1 A. M. to 29.72 at noon, when a strong breeze at S. b. W. with a very high

sea. Lat. Obs. $10^{\circ} 37'$ S.; Long. $82^{\circ} 22'$ east. Course and distance S. 59° W. 269 miles in 2 days by Chr. giving $11'$ of Southing and $93'$ of Easting for the storm current and storm wave.

Abstract from the Log of the Barque BRAEMAR, Capt. TETHERINGTON, from Calcutta to Mauritius.—Reduced to Civil Time.

21st April, 1848.—At noon Lat. $6^{\circ} 43'$ S.; Long. $88^{\circ} 10'$ east; Bar. 29.77; Ther. 84° . P. M. wind N. E. to East, steering to the S. S. W. 5 to 6 knots per hour. Cloudy with a confused sea on.

22nd April.—A. M. fresh gales N. N. E. with a high rolling sea; towards Noon wind N. E. b. E., sea increasing. Course always S. S. W. Lat. $9^{\circ} 01'$ S. Long. $86^{\circ} 46'$ east; Bar. 29.74; Ther. 82° . P. M. wind N. E. Fresh gales drizzling rain and a high rolling sea. 8, increasing “with heavy seas from the N. West S. E. and S. W.” Close reefed; to 6 P. M. steering S. S. W. and afterwards South. Wind N. E., Bar. 29.54 at 4 P. M. and 29.58 at midnight

23rd April.—A. M. ran $48'$ south and hove to in Lat. $11^{\circ} 9'$ S.; Long. $86^{\circ} 28'$ east by Acct.; wind N. E. (apparently) to 10 A. M. when it is marked E. N. E. 8 A. M. “gale suddenly increasing.” Noon a high turbulent sea, Lat. Acct. $11^{\circ} 7'$ S.; Long. Acct. $85^{\circ} 54'$ E.; Bar. 29.45. Vessel lying S. S. E. drift marked 1.4 per hour with wind marked E. N. E. 2 P. M. wind E. N. E. Bar. 29.45. 8 P. M. 29.35; wind veered to S. E. Midnight a perfect hurricane, with a terrific sea on, making a clear breach over all. Bar. midnight 29.25.

24th April.—2 A. M. hurricane veered to the southward (it is marked South at midnight). And at 4, S. S. W. still increasing. At 8, vessel on her beam ends; Bar. 29.16; and being in danger of foundering cut away the mainmast; 4.30 P. M. Bar. began to rise; lowest point being at 4 A. M. 29.15. Forenoon hurricane slightly abating, with a tremendous sea from N. West; N. East; S. E. and S. W. Bar. at noon rising; Lat. $11^{\circ} 27'$ S., Long. by Acct. $85^{\circ} 68'$ east. P. M. to midnight wind S. S. W. decreasing to strong breezes.

25th April.—To noon moderating from S. S. W. making sail. Lat. Obs. $11^{\circ} 9'$ S.; Long. $85^{\circ} 02'$ east; Bar. $29^{\circ} 70'$; Ther. $84^{\circ} 00'$.

Abridged Log of the Ship LADY SALE, Capt. CASTOR, from Calcutta to the Mauritius.—Reduced to Civil Time.

20th April, 1848.—Steady breeze at N. W. and North to midnight.

21st April.—Wind North, strong breeze and squally, increasing to noon with a heavy sea from the S. E. Noon Lat. Obs. $8^{\circ} 16'$ S.; Long. $86^{\circ} 35'$ East. Course and distance from noon 21st S. W. $\frac{3}{4}$ S. $14\frac{1}{2}$. P. M. wind North at 6 P. M. N. E. 3.30, a heavy squall. Bar. falling to 29.40; from 29.70; (in the

fine weather of the 20th it is supposed, as the exact time is not given). At 11, hard squalls and a high sea Bar. 29.35.

22nd April.—Preparing for bad weather. Noon hard gales and high sea, wind veering to the Eastward. Lat. Acct. $9^{\circ} 10' S$; Long. about P. M. severe gales E. N. E. threatening weather and dismal appearance. At 4, wind East; at 6, E. S. E.; at 10, S. E. Close reefing and battening down hatches and making all preparations for a hurricane. 4 P. M. Bar. 29.20. Gale increasing with violent gusts.

23rd April.—At 2 A. M. hove to; Bar. 29.18; at 5, gale increasing to a hurricane and veering to the Southward. 5.30 ship on her beam ends with the lee rail buried in the water. Cut away the mizen mast and quarter boats and hove some cargo overboard. Wind veering fast to S. W. but blowing with indescribable violence. Bar. 29.15. At 4.30 A. M. Bar. 29.32; but abating; noon Bar. 29.40. P. M. strong breezes S. b. W. and South, and S. b. E. at midnight.

24th April.—Fine. Noon Lat. Obs. $10^{\circ} 44' S$; Long. $81^{\circ} 24'$ east; wind S. b. E.

*In addition to his Log, Capt. Castor has farther obliged me with the following notes:—

From the 20th April to the morning preceding the hurricane the winds prevailed mostly from N. W. to N. with a long swell rolling to the Southward from the N. E. with hard squalls, accompanied with heavy showers of rain. The wind gradually veered from N. N. E. to E. and S. E. ending with indescribable fury at S. to S. W. The moon was encircled with an immense halo which had the appearance of a dense cloud for three successive days before the Cyclone; the light of the moon, and stars was uncommonly brilliant during the existence of the halo, a great oppression in the atmosphere was felt. Sky at night almost cloudless, the wind never *shifted* in this hurricane, but veered gradually, the sea ran high, and rain poured down in torrents, accompanied with violent gusts every fifteen to twenty minutes. Bar. two days previous to the hurricane stood at 29.70, and fell gradually with the state of the weather to 29.15; and remained at that range during the height of the storm. It began to rise an hour or two before the worse part abated. After the hurricane the winds prevailed for two days from the southward and westward, light and variable, with a long swell from the S. E.

N. B.—The wind was stronger than in the hurricane experienced on the 16th of November, 1839, when Coringa was inundated, but the sea less. I remember the wind in that storm shifted from four to six points, but in this it veered gradually.

Extract from a Tabular Statement of the Voyage of the H. C. Pilot Brig SALWEEN, from Port Leschenault to Calcutta.—Nautical Time.

21st April, 1848.—Made 67 miles to the W., N. W. winds variable N. E. to N. N. W. Lat at noon $6^{\circ} 20'$ S.; Long. $86^{\circ} 6'$ east; Bar. 29.30 to 29.60; Ther. 81° . Light winds, squally wet weather, thunder, lightning and rain, and threatening appearance with a N. N. W. sea.

22nd April.—Made 19' to the N. W. b. W. $\frac{1}{2}$ W. only; winds variable from N. E. to N. N. W. and Northerly. Lat. at noon $6^{\circ} 20'$ S.; Long. 85° east; Bar. 29.60 to 29.75; Ther. 83° . Squally wet dirty weather with a bad threatening appearance! *Am sure we are not far from some very severe weather from the very threatening appearances of some days past.* Sent top gallant masts on deck and made all due preparations for meeting a hurricane. Spoke H. M. Brig *Jumna*, 9 days from Bombay, running to the southward.*

Abridged Log of the Ship FUTTLE ROZACK, Capt. RUNDLE, from Calcutta to the Mauritius.—Civil Time.

This able Log affords a valuable and instructive example of a ship being caught in front of a Cyclone in the Southern Hemisphere, and though bound to the W. S. Westward running to the N. Westward to allow the centre to pass. The passages in italics are so marked by myself, and I may add that the *Futtle Rozack* is a heavy sailing ship, and was deeply laden with rice and coolies.

From the 17th April, when in Lat. $5^{\circ} 53'$ S.; Long. $86^{\circ} 4'$ East at noon to the —

19th of April.—At noon in Lat. $7^{\circ} 38'$ S.; Long. $85^{\circ} 36'$ east; the ship had light variable winds all round the compass with calms and squally appearances at times; the Bar. being on 17th at noon at 29.71; Simp. at 29.27 and Ther. 84° ; and on the 19th Bar. 29.60; Simp. 29.27; Ther. 82° . On the 18th, Capt. Rundle remarks—"Noon light breeze and cloudy, Bar. and Simp. very low and have been gradually going down this last four days. Preparing for bad weather." And P. M., again, that "the weather is suspicious, or rather that the continued fall of the Bar. and Simp. is so, but the *weather* altogether does not appear to indicate the approach of any great change more than we might expect on the verge of the S. E. trade, although this heavy S. E. swell rolling up is suspicious."

* I regret much that this Register is in Nautical Time and that there is no hour affixed to this notice.

On the 19th April.—From A. M. to noon winds variable from N. N. E.; North-West; W. S. W.; S. W. b. W. and S. W. ship running to the S. S. W., S. W. b. S.; South; S. S. E. and S. E. from 2 to 7 knots; squally unsettled weather and S. E. swell. Noon moderate. Light S. S. W. breeze, heavy sea with dark ponderous masses of clouds rolling up from the southward to the zenith and then gradually disappearing. Lat. Indiff. Obs. 7.38 S.; Long. 85° 36' East; Bar. 29.60; Simp. 29.27; Ther. 82°. P. M. S. E. airs and a stationary bank of dark Nimbi to the S. Eastward. Clouds A. M. Cumuli, cumulo-strata, and dense packed Nimbi. To midnight wind increasing and decreasing from the S. E. every 3 or 4 hours.

20th April.—A. M. winds East to N. E. and E. N. E. at 10 A. M., and moderate. Ship making from 7 to 4.4 knots to the S. S. W. Noon Lat. Acct. 9° 14' S.; Long. 85° 14' East; Bar. 29.52; Simp. 29.20; Ther. 83°. P. M. wind N. E.; E. N. E. and East at 6 P. M. when again S. East, E. N. E. and N. N. E. to midnight. At 4, clear sky to the North, and dark and heavy to the Southward, midnight fresh N. N. E. breeze and very heavy rain clouds. P. M. dense strata.

21st April.—A. M. strong squalls N. E. veering to East and to E. S. E.; at 4 A. M. with heavy rain; daylight strong gales and heavy sea. Weather like the commencement of a strong trade, but Bar. and Simp. too low to feel satisfied with appearances. Noon fresh gales S. E. (from 10 A. M.) Lat. Obs. 10° 23' S.; Long. Chr. 84.5; Bar. 29.55; Simp. 29.20; Ther. 83°. Clouds A. M. Cirro cumuli, leaden stratus to S. E. P. M. threatening weather to the Southward, wind S. E.; at 2, S. S. E. veering to E. b. S.; at midnight marked S. E. again; at 5, strong gales, and at 8, heavy gusts at intervals with a frightful turbulent swell and a confused sea breaking heavily all round "as if the ship was surrounded by coral reefs." *From 9 to midnight more moderate.* Bar. 29.54; Simp. 29.18; Ther. 82°. Clouds P. M. leaden coloured.

22nd April.—A. M. wind E. S. E. to S. E. 10 A. M. S. E. b. S. At noon S. E. 2 A. M. dense threatening arched banks, continually rising from S. E. with much rain and tremendous squalls. 9, squalls continue with frequent lulls. Bar. at 29.43 and continuing to fall. *Feeling convinced that if we stand any farther to the Southward (S. W.) we shall get involved, and that the storm is tearing down on us from the Eastward.* At 10, stood away N. W. to get clear of its influence. At 11, very high sea at intervals, strong squalls, wind veering to the Southward. (S. E. b. S.) Noon the same with a gloomy leaden appearance; Lat. D.R. 11° 38' S.; Long. 82° 49' East; Bar. 29.50; Simp. 29.21; Ther. 82°. Clouds A. M. heavy low leaden strata. Ship now running 6 knots to the N. W. P. M. more moderate; under close reefed fore and main topsails; at 2, tremendous turbulent sea rising in heaps. Wind S. S. E. at 1; S. b. E. at 3; S. S. E. at 5 P. M.; after which alternating from S. $\frac{1}{2}$ E. to S. E. to mid-

night. At 3 p. m. same gales. Sun inclined to break through the clouds. At 6, squalls less frequent. A red lurid appearance to the W. N. W. Bar. from 29.49 to 29.52; at 9 p. m. Simp. 29.19 to 29.93. Ther. 81°. Midnight thick weather and rain. Clouds, heavy stratus. Stationary cirrus over all.

23rd April.—A. m. less wind and sea except in the squalls, with occasional rain. Wind S. b. E. to S. E to 5 A. M. when South to noon. Bar. 29.49 to 29.54; Simp. 29.16 to 29.20; Ther. 82°; 2.20 A. M. moon and stars shining brightly. Ship running to the N. W. till 10 A. M. when North till noon. Daylight more sea; at 6 A. M. fine and clear over head, moon shining brightly. Lofty wavy cirrus from N. E. to S. W. Gloomy appearance towards the horizon from North to Eastward and S. Westward, *tremendous high curling seas at intervals*.* At 8, wind South; lofty cirri and dark cumulo-strata with rounded edges rolling up from S. S. E. Less wind, Bar. rising, bore away to North at 10 A. M. Noon moderating from over head, but threatening spherical cumulo-strata rolling up from Southward *with tremendous overgrown seas at intervals*. Wind moderating. Lat. Obs. 9° 45' S.; Long. 80° 28' East; Bar. 29.54; Simp. 29.20; Ther. 82°. P. m. kept a N. E. course; at 2 steady gales South to S. b. E. thick and threatening appearance to Southward *and tremendous seas at intervals*. At 4, Cyclone seeming to have a slow progression to the Westward; resolved instead of steering to get to the Eastward of it (behind it) to run to the Westward, and should we find it coming up again can easily get out of its influence by running to the Northward. Stood to the Westward at 9 p. m. 10, light squalls with rain at intervals from arched Nimbi rising from the South and rapidly approaching the zenith; stars visible but sickly appearance. Wind South to S. b. E. throughout. Bar. p. m. 29.50 to 29.50; Simp. 29.18 to 29.24; Ther. 82°. Clouds; packed dark cumuli to S. East: Stationary cirri over all.

24th April.—Weather gradually becoming fine. Winds moderate at South to S. b. E. to noon, when Lat. 9° 39' S.; Long. 78° 37' East; Bar. 29.60; Simp. 29.22; Ther. 83°. At 4 A. M. ponderous clouds to S. East, scud flying with great rapidity to the Northward.

The following extract is from the *Calcutta Englishman*. I have been unable to obtain a copy of the *Hardwicke's Log*.

A friend has sent us the following extract from the letter of a passenger on board the *Earl of Hardwicke* :—

* These high curling seas at intervals appear well worthy of consideration, I have often met with notices of them. They are no doubt the *resultant waves* of the distant Cyclone forces.

“ From the 18th March, 1848, the day on which the *Hardwicke* left the Sand Heads, until the 19th April, we had hot sultry calm weather, but upon the 22d April, 1848, in Lat. 12° South ; Long. 83° East ; we had a fearful hurricane, which lasted 3 days. It blew from the S. E. and, under Providence, I consider that Mr. Piddington's instructions saved us from being foundered. The Captain, Lewis Browne, had been studying his book a whole month before the hurricane commenced, so that, when it did come, he was prepared, and being in the proper spot he lay to, and so the storm passed us. I have been to sea pretty often, but I never saw anything so awful as the sea during the three days that we lay to. I forgot to get the extract from the Log ; but get it you must, as it will be a good link in the chain of this invaluable branch of knowledge.”

In a letter from Capt. Faucon, American Brig *Frolic*, he mentions that—

The *Ormelie* of Glasgow, from Calcutta to Liverpool, reports, that on Sunday last, April 23rd, 1848, he was in 8° S. ; and 89° East ; had a heavy gale from the Westward ; lost top gallant masts, jibboom, &c. and sprung his bowsprit.

Tabular view of the Winds and Weather from the 21st to the 23rd April, 1848.

THE JUMNA'S CYCLONE.

Date.	Name of Ship or Station.	Lat. S.	Long. East.	Winds and Weather.	Bar.	Simp.	Ther.	Remarks.
1848. 21st April.	Braemar.	6° 43'	88° 10'	Cloudy and confused sea. Wind N. E. to East.	29.77	..	84	Vessel steering to S. S. W.
	Sultany.	8° 15'	86° 22'	Variable winds from North at Noon, to N. E. and N. N. E., P. M.	29.75	..	..	Reducing sail and preparing for bad weather. Threatening appearance, and heavy swell from N. N. E.; 10 P. M. under close reefed fore topsail.
	Samarang.	8° 16'	86° 14'	Increasing breeze N. E. and squally. P. M. N. E. b. E. squally.	29.79 29.68 Mid.	..	83°	Vessel running S. W. 8 knots, Ten P. M. moderating, but Bar. always falling.
	Lady Sale.	8° 16'	86° 35'	Noon, North, strong breeze. P. M. North, 6 P. M. N. E. 11, hard squalls. ε	29.40 29.35 Mid.	..	..	Noon heavy sea from S. E. Ship running to the S. W.
	Futle Rozack.	10° 23'	84° 5'	A. M. strong squalls N. E. to East and E. S. E. Noon S. E. fresh gales. P. M. threatening to the South, wind S. E. and S. S. E.; E. b. S. and S. E. at midnight.	29.55 29.54 Mid.	29.20 29.18	83° 82	By 5 P. M. strong gales with heavy gusts, with a turbulent swell and confused sea. 9 to Midnight, more moderate.

JUMNA'S CYCLONE.*

Date.	Name of Ship or Station.	Lat. S.	Long. East.	Winds and Weather.	Bar.	Simp.	Ther.	Remarks.
1848. 22nd April.	Braemar.	9° 01'	86° 46'	N. E. b. E. P. M. N. E. fresh gales, drizzling rain.	29.74 4 P. M. 29.54 Mid. 29.58		82°	Ship running to the S. S. W. and South. High rolling and confused sea.
	Sultany.	9° 24'	84° 35'	N. E. increasing. 9 P. M. North, Midnight N. E. furious squalls.	7 A. M. 29.64 Noon 29.63 ½ P. M. —.35 4 ——.12		83°	Increasing gale throughout. 3 P. M. hove too.
	Samarang.	10° 27'	83° 34'	A. M. N. E. b. E. hard squalls. At 10 a Gale.	1 A. M. 29.67 Noon —.52			Ship running 7 and 8 knots to the S. W.
	Lady Sale.	9° 10'	..	Noon hard gales and high sea, Wind veering to Eastward. P. M. E. N. E. 4 East; E. S. E. 10 S. E. increasing.	4 P. M. 29.20			Preparing for bad weather P. M. threatening.
	Futle Rozack.	11° 38'	82° 49'	A. M. E. S. E. to S. E; 10 S. E. b. S. Noon S E. b. S. P. M. more moderate, Wind S. S. E. to S. E.; E. and S. E.	9 A. M. 29.48 Noon 29.50 P. M. 29.49 29.52	29.21 29.19 28.93	82°	2. A. M. Dense threatening clouds. 9 heavy squalls and frequent lulls. At 10 stood N. W. to clear the Cyclone. Running 6 knots to the N. W. Midnight thick weather and rain.

JUNNA'S CYCLONE.

<i>Date.</i>	<i>Name of Ship or Station.</i>	<i>Lat. S.</i>	<i>Long. East.</i>	<i>Winds and Weather.</i>	<i>Bar.</i>	<i>Simp.</i>	<i>Ther.</i>	<i>Remarks.</i>
1848. 23rd April.	Braemar.	11° 7'	85° 54'	To 10 A. M. N. E.; when E. N. E.; 8 in- creasing suddenly. P. M. E. N. E. 3 P. M. Veered to S. E. Midnight hurri- cane South.	29.45 29.45 8 P. M. 29.35 Mid. 29.26			Ran 48' South and hove to, Ly- ing to, terrific sea. Head S. S. E.
	Sultany.	9° 32'	83° 37'	A. M. Hurricane from N. E. Noon wind all round the compass. P. M. S. W. 11 P. M. West.	29.16 6 P. M. —.12 7 ——.15 8 ——.20 Mid. —.28 1 A. M. 29.39			A dreadful sea and thick dense atmosphere from 8 to 10 P. M. Vivid lightning with a remarkable red ap- pearance to the S. E. all night.
	Samarang.	10° 32'	82° 10'	Hurricane S. E. 8 A. M. South. Noon more moderate P. M. South 3 P. M. S. S. W. 8 P. M. West.	29.50 Noon 29.48 Mid. 29.62	76°		Heaving cargo overboard and all hands at the Pumps.
	Lady Sale.			5 A. M. Increasing to a hurricane and veering to the South and S. W. Noon abating. P. M. Strong breeze. S. b. W. to S. b. E.	2 A. M. 29.18 5 30 29.15 4 A. M. 29.32 Noon 29.40			5. 30. Ship on her beam ends; cut away mizen mast and hove cargo overboard.

JUMNA'S CYCLONE.

Date.	Name of Ship or Station.	Lat. S.	Long. East.	Winds and Weather.	Bar.	Simp.	Ther.	Remarks.
1848. 23rd April.	Futtle Rozack.	9.45	80.28	S. b. E. to S. E. at 5. South to Noon. Less wind 6 A. M. fine and clear 8 South, 2 Steady gales S. to S. b. E.	29.49 — .54 Noon P. M. — .61	29.10 29.20 — 20 — 24	82 82 82	Ship running to the N. W. till 10 A. M. and North till Noon. P. M. Wind South to 4 P. M.; hauled to the Westward again.
	H. M. S. Jumna at 3 A. M. Noon 3 P. M.	8.59 10.28 11.08	85.34 85.07 84.43	3 A. M. came on to blow from N. W. 5 West, 8 N. N. W. 1 P. M. N. W. 3 N. N. W. and Calm to 4.15 P. M.; at Midnight hurricane from W. and S. W.	29.57 Noon 29.33 3. — 29.21 Midnight 29.16		82 82 82	From 3 A. M. to Noon running from 9 to 12 knots to the S. S. W. 5.30 P. M. hove to. 10h. 45'. Went over and cut away main mast.
1848. 24th April.	Braemar.	11.27	85.08	2 A. M. South, 4 A. M. S. S. W. and increasing. Bar. rising at Noon.	3 A. M. 29.16 4 — 29.15			4 A. M. cut away mainmast. Forenoon; Hurricane slightly abating. Sea from all quarters. P. M. to mid. wind S. S. W. decreasing to strong breezes.
	Sultany.	10.37	82.22	A. M. Wind S. S. W. Noon strong breeze S. b. W.	29.62 to 29.72 at Noon			
	Samarang.	10.37	82.22	A. M. S. S. W. 6 A. M. S. b. W. Noon strong breeze S. b. W.	1 A. M. 29.62 Noon 29.72			Sea going down; 4 feet water in the hold. P. M. fine.
	Lady Sale.	10.44	81.24	Fine Weather.				
	Futtle Rozack.	9.39	78.37	Gradually becoming fine, Wind S. E. b. E.	29.60	29.22		4 P. M. heavy clouds to the S. E.

PART III.

I now proceed to state briefly the grounds upon which the tracks of these Cyclones are laid down on the Chart, beginning with that of the *Sir Howard Douglas*.

I have first given the logs of two vessels to the Eastward, the *Isabella Blyth* and *Wellesley*,* of which the first certainly had the rearward swell† of the advancing Cyclone on the 15th, when the outer circumference of its S. E. quadrant might have been at about 120 miles from her position; and Captain Baylis very truly conjectures from the “confused heavy swell from the Westward” which was that of the Cyclone, and the lesser swell from the Eastward which was occasioned by the Trade wind, that “it must have been blowing hard somewhere to the Westward” of his position.

The *Wellesley* it will be recollected, was also a homeward bound ship, but she was on the 12th in 10° 43' South and had then had the commencement of her gale since the 11th. As on the 12th she had the wind at N. N. W. which makes the centre bear from her W. S. W. it is difficult to suppose, without any intermediate evidence, that her Cyclone, if it was one, was the same as that of the *Sir Howard Douglas* on the 15th. I have therefore marked her track on the Chart rather as giving another laudable instance of the caution necessary in this dangerous tract of the Ocean.

We now come to the three ships near to which the centre must have passed between the 15th and 16th which are the *Sir Howard Douglas*, *Admiral Moorsom*, and *Polly*, all of which had, by noon on the 15th, the Cyclone evidently commencing with strong gales from the S. E. and were running up to the Northward to cross in front of it, in entire ignorance of their danger in so doing. But of these three ships the position of the *Polly* is as we shall see altogether uncertain, and that of the *Admiral Moorsom* also, on the next day, is a mere estimation. Taking as nearly as

* A statement, from memory, by the master of the Barque *Iris* was also forwarded to me by Captain Twynham; but this vessel was on the 10th, in 12° South and 90° East when the weather became so suspicious as to induce Captain Twynham to believe he was passing near a Cyclone to the Westward of him, which indeed may have been the case, but it was not that of the *Sir Howard Douglas*; and as no Barometrical observations were made it is not certain even that it was a Cyclone. It might have been the *Wellesley*'s.

† See Col. Reid's new work on Storms and the Variable Winds.

may be, a mean position for the centre of the Cyclone from the imperfect data given in the logs I should place it at this time in Lat. $9^{\circ} 5' S.$; Long. $81^{\circ} 55'$ East; and as it passed a little after midnight close to the Northward of the *Sir Howard Douglas*, when she was upset, its rate of travelling may have been not quite 11 miles an hour, on a W. S. W. course. I have also marked the position of the *Sir Henry Pottinger*, as given by Captain Baylis, but as he does not say at what time on the 14th, nor with what wind she cut away her foremast, we can only infer that the Cyclone certainly came down from the E. N. E. as we have marked its track and that probably she was close to, or at its centre.

We then find that it passed close to the North of the *Polly*, and to the South of the *Admiral Moorsom* between 3 P. M. of the 15th and 5 A. M. of the 16th; though the positions of the vessels must be to some extent uncertain, as they were all running at night before a furious gale increasing rapidly to a hurricane; when all hands in a merchantman have full employment, and the log is usually marked the next day from recollection. We may infer that the *Sir Howard Douglas'* run is perhaps under-marked, for this direction of the track makes the centre pass at 33 miles distance from her, and from her log and low Barometer she may have been somewhat closer to it; judging also from the rapid veering of the wind with her after she went over.

After the track is carried past this group of vessels we have no farther data than the Log of the *Strabane*, which ship no doubt experienced the same Cyclone, for we see from Captain Anderson's well kept notes* that he was watching and noting the atmospheric indications on the 16th; and it is highly instructive to compare his remarks on the sea of the advancing storm with those of Captain Baylis of the *Isabella Blyth* in its rear, to see how perfectly good observers on opposite sides of the same Cyclone are warned of its approach or vicinity by these too-much-neglected signs.

The Log of the *Victoria* is so imperfect as regards position that we

* They are still but notes, and I should have been glad to have had the whole Log with them, for the point at which the track of the Cyclone crosses the ship's track is somewhat uncertain, because we have not her exact run, hour by hour to calculate with, but only the distance from noon to noon, whereas she was no doubt going much faster in the first than in the latter part of this twenty-four hours.

can make no use of it, farther than to say that it seems pretty closely to corroborate our estimation of the track ; for from where she is marked in the Chart on the 15th (which is still but an approximate position) she had only to run down with the North Westerly gale which she must have had thereabouts, to plunge into and cross the track of the Cyclone in its rear as she evidently did. Her damage and narrow escape from foundering, as well as that of the *Sir Howard Douglas*, and the narrow escapes of the *Polly* and *Admiral Moorsom* from far worse loss than they suffered, are all instances of lamentable error; for they might all have escaped with a close-reefed-topsail breeze by heaving to for six hours, or if in the cases of the *Polly* and *Admiral Moorsom* they had thought it right, upon cool calculation, to risk crossing in front, they should have kept to the Westward far enough to maintain their Barometers without any farther fall, and even to raise them a little ; without which their running was decidedly unsafe ; and was indeed at no time worth the risk for the short amount of time and distance which it could have saved.

Returning to the details of the track : We find that noticing carefully the indications of the weather the *Strabane* ran up from Noon of the 16th to Noon of the 17th on a N°. 30° East course, so as to cross in front of the Cyclone and allow it to pass astern of her.* She had the wind about South at Noon, placing the centre (if the Cyclone had commenced) due East of her and veering to West and finally to “a furious gale” at N. W. at midnight ; so that the Cyclone had passed just astern of the vessel in the interval between Noon and midnight.

As before noted we have not the exact run, neither have we the hours at which the winds were certainly at the points marked ; so that we cannot exactly lay down the point at which the Cyclone’s track crossed that of the ship, but as her position is carefully given, there is no doubt that, from that of the *Polly* and *Admiral Moorsom* the track

* Which however was done too closely for perfect safety ; a North course or even one to the N. b. W. would have been a safer one, as carrying the ship more rapidly across the line of the track, which she would have possibly have done so as to run easily to the N. Eastward when the Westerly part of the vortex reached her. In questions like this however, all depends upon the point at which a vessel in a heavy breeze and sea steers best, and what the heave of the sea is.

curved considerably to the Southward and again to the North, to pass as it did so close to the South of the *Strabane*, so as to bring the wind from South to North West in 12 hours, and to depress her Barometer from 29.50 to 29.40.*

With regard to the rate of travelling we can only say that it seems evidently by the short duration of that part of the Cyclone which was of hurricane violence, and judging also from the estimated positions of the centres on the 15th and 16th, and midnight of the 16th and 17th that it cannot have been below 15 or 16 miles an hour. The rapid and sudden fall of the Barometers of the *Polly* and *Admiral Moorsom* within a short period shews that, for them, the more violent part was of limited extent but proportionably severe. The Barometer of the *Sir H. Douglas* did not indicate this peculiarity, but it may have been a more sluggish instrument.

A curious remark is made at the close of the *Polly's* Log, viz. that the observations between the 15th and 19th shewed that the ship must have been drifted *four degrees* to the Westward in the hurricane! Now this is scarcely possible, for the other ships would also have been carried to the Westward and no doubt have noticed it, to say nothing that the *hurricane* part of the storm did not last more than 24 hours at most, so that we must suppose here a storm wave of 10 miles an hour! which is quite unprecedented. I should rather suppose some error in the observations? or that the Chronometer had been injured during the Cyclone? We must not forget however that this throws much uncertainty on the *Polly's* position, and thus our track may not have been quite so abruptly curved as we have made it. Yet it is clear that we have yet much to learn regarding the tracks in this quarter of the Ocean; and such a one as is shewn by these ships' Logs may doubtless occur, and the Mariner has here another caution when a Cyclone is commencing with him.

THE JUMNA'S CYCLONES.

The following are the considerations upon which the track of these Cyclones are laid down.

* By a Barometer diagram which is sent with the extract the Barometer seems to have been at its lowest at about 3 A. M. of the 17th (probably an error) though the Log states it to have risen after midnight. The Simplesometer both by the Log and diagram appears to have been lowest at about midnight.

We find, that on the 21st of April, the *Braemar* in $6^{\circ} 43'$ S. and $88^{\circ} 10'$ East had cloudy weather with a confused sea ; and the wind from N. E. to East, her Barometer being still at 29.77 ; and that the *Samarang*, *Lady Sale* and *Sultany* all very near each other, but 140 miles to the S. W. of the *Braemar* had also strong Northerly and N. Easterly breezes, increasing, and with squalls, and their Barometers falling ; and by midnight they were all preparing for bad weather. We cannot from this infer anything as to the existence of a Cyclone to the N. Westward of them on this day at Noon, and indeed had any existed it would have been felt by the *Jumna* and *Salween*, both of which were in that direction, the *Salween* being only $130'$ to the W. b. N. of the *Braemar*.

But at 320 miles to the S. West of the *Braemar* and 180 to the S. West of the *Sultany*, *Lady Sale* and *Samarang*, it appears that the *Futtle Rozack* having had the wind in strong squalls from N. E. to E. S. E. and S. E. at Noon, had by 5 p. m. strong gales with heavy gusts, turbulent swell and confused sea, with her Barometer at 29.55 and 29.54. At midnight it did not fall more, because she was still running to the W. S. W. and S. W. and out of the Cyclone circle, if we take it now to have been one, as it seems by her Log to have just commenced, or formed, (or *descended*) somewhere to the N. W. of her.

It was midnight also before the *Pemberton* began to experience any bad weather. She being at this time perhaps with the light winds and calms described in the note, in about $7\frac{1}{2}^{\circ}$ S. and $82^{\circ} 50'$ East, and indeed, if the winds are correctly noted in the newspaper account, which was no doubt the Captain's report, the Cyclone of this ship and the *Deborah* was a small one travelling rapidly to the S. East, a very unusual track hereabouts. I shall revert again to these vessels and I notice them now merely to shew that, for this day, the *Pemberton's* position could have no relation to the *Futtle Rozack's* bad weather. The newspaper position I take to have been as usual *about* where the gale was most severe, and Mr. Meldrum's to be the calculated position at noon of the 22nd, and that the date given by the Captain is that of the worst weather on the 23rd, when the vessel had drifted back to the Northward.

On the 22nd of April, we find that the *Braemar* had run down 160 miles to the S. S. W. and South with fresh gales and drizzling rain from the N. E. b. E. to N. East, and a high rolling sea ; her Barometer

falling from 29.74 at Noon to 29.54 at 4 P. M. The next ships to her are:—

The *Samarang* 200 miles to the W. S. W. with the wind about E. N. E. The *Sultany* about 130 miles to the W. b. S. and the *Lady Sale* about 115 miles to the W $\frac{1}{2}$ S. with the wind about E. N. E. and these vessels had all by noon gales, or every indication of bad weather. The note of the *Deborah* affords us no information as to the weather on the 22nd, and the *Pemberton's* has no position. As however, both these vessels were from Bombay we may take them, like the *Jumna*, to have been running down to the S. b. W. or S. S. W. at most, to get the trade wind as soon as they could. The bearings of the centre from the ships *Samarang*, *Sultany* and *Lady Sale* will not cross so as to meet at any point near enough to assume it as a centre, and if the centre was at all distant the circle would include H. M. S. *Jumna* and the H. C. P. V. *Salween*. And we know of the first that she “had the usual fair (westerly) winds with heavy squalls thunder and lightning” till the 23rd of April, and of the *Salween* at 170 miles to the N. N. W. of the *Braemar*, that though, as with all the ships, she had very threatening appearances, yet it was fine enough to allow her to speak the *Jumna*.

Hence we may suppose that, if the Cyclone was formed at Noon of this day, it was only so overhead, and was settling down: perhaps unequally; i. e. With its S. Eastern and Southern quadrants more inclined to the earth than the Northern and North Western ones; or that the Westerly Monsoon was still strong enough to the Northward to force its way beneath and impede the due surface action of that side of it. I do not mean as regards the wind, but as regards its electric action. The mere winds only would have assisted each other, both being from the Westward. We cannot thus fairly assign any centre to this Cyclone for the 22nd.

We find that the *Futtle Rozack*, which ship on the 21st had every indication of a Cyclone to the Northward and Eastward of her, ran on to the S. W. with the S. Easterly gales of its S. West quadrant till her Barometer fell to 29.48; and at 10 A. M. bore up to the N. W. to get out of it, bringing the wind to S. S. E. at 5 P. M. and to S. $\frac{1}{2}$ East and S. east at midnight, so that we may suppose, with so accurate an observer as Captain Rundle, and the full detail of his careful obser-

uations that there really was a smaller precursor Cyclone in his wake as he supposes, on the 21st and 22nd, and that it passed near to the *Hardwicke* by the imperfect newspaper notice which I have obtained, that ship being only 25 miles to the South a little East of the *Futtle Rozack*.

On the 23rd of April.—Taking the ships now from the Westward* we see that the *Deborah* had on this day a small Cyclone centre crossing her which is called a hurricane, and lasted for four hours only. It is difficult to say from such scant information if this had any relation to the next ship's hurricane, the *Pemberton*, which appears from Mr. Meldrum's account to have had the centre of the Cyclone passing over her not far from the spot of which he has given the Lat. and Long. on the 22nd, but as we are quite in the dark as to whether she was running or hove to; and as the copy of his letter sent me from Bombay differs from the newspaper report, we can merely take the whole as a *sort* of confirmation, but nothing else. The shift given by the newspaper report, N. N. W. to W. S. W. would also give a Cyclone track to the S. E. like that of the *Deborah*; and as the *Pemberton* was a cotton-laden ship bound to England, she probably ran on as long as she could do so under the temptation of the fair wind from N. N. W. I should take the *Deborah's* to be a separate Cyclone of small dimensions, but it is scarcely possible to trust to these scant, and so frequently erroneous newspaper notices.

We have next the Log of the *Lady Sale*, but unfortunately her positions are only given on the 21st and 24th, and the extract from her log giving no distances run, or rate of drift, I cannot work up the dead reckoning. We can only then estimate roughly that as her track and drift cross that of the Cyclone, and as she was evidently hove to close on the western verge of the centre at 4 P. M. on the 22nd, she had probably run down about 200 miles from her position on the 21st before she hove to; which would place her at that time, i. e. 2 A. M. 23rd, in Lat. $9^{\circ} 44'$ S.; Long. $83^{\circ} 43'$ East, when, as the wind is marked due East in her log, she had the centre North from her, and between this time and noon of the 23rd the centre, as we see from

* Because from the shifts given in the notices of the *Deborah*, *Pemberton* and others, N. E. to S. W., it is clear that their Cyclone was travelling to the S. Eastward / a very unusual track, but one fully shewn to be correct by all the Logs. .

the veering of the wind, was passing her close to the N. Eastward while she was hove to; the Cyclone leaving her with a strong breeze only, from the Southward, by noon of the 23rd, when she might be about 172 miles West from the position of H. M. S. *Jumna* at that time, which would give about 150 miles for the semi-diameter of the Cyclone taking the *Jumna* to have been at noon close on the eastern verge of the centre.

The next ship, and she must have been not far from the *Lady Sale*, is the *Samarang*. We find that her Easterly gale had increased to a hurricane from E. b. N. by 8 P. M. of the 22nd; and that at midnight her Barometer had fallen to its lowest, 29.39, with the wind about E. S. E. veering to South at 8 A. M., and moderating with the Barometer at 29.50 by Noon. Hence it is clear that the centre passed her to the Eastward, and if we take the average strength and shift of the wind to have been from E. N. E. when it is described on the 22d as an increasing gale, obliging the ship to be hove to, to South, this would give a S. E. b. E. course for the body of the Cyclone.

We have then the *Sultany* to the N. Eastward in about $9^{\circ} 32' S.$; and about $83^{\circ} 27'$ East, or not quite midway from the *Pemberton* and *Deborah*, a little more than 100 miles N. E. of the *Lady Sale*, and not quite 100 miles N. West of the *Jumna*; and we find that at noon, in about this position, she must have been at the centre since she had "the wind all round the compass with a dreadful sea and thick dense atmosphere, the vessel lying with her lee gunwale in the water."*

H. M. S. *Jumna*, to which we now come, has her position also as well ascertained as that of vessels can be in weather of this nature, and so far better than the *Sultany's* that the *Jumna* was going free and the *Sultany's* drift only can be estimated. We see that she was at the distance of 98 miles to the S. E. b. East of the *Sultany*, which would have given her if she had the same Cyclone a N. E. b. N. wind, instead of which we find she had one to the Westward of North that is N. N. W. ! at Noon, or one differing five points. This is not reasonably reconcileable and we may either suppose that H. M. S. *Jumna* had a smaller Cyclone travelling down with her, in her run on this day, and that it was about the spot where the *Sultany's* and

* The *Sultany* is one of the finest ships out of the Port of Calcutta, of 1000 tons burden, and ably commanded. We see that she was fully prepared for the hurricane, though from its unusual track she was involved in it.

Jumna's Cyclones met that the latter vessel was upset, or that there were some excessive incurvings of the winds with her at this distance from the centre.*

For we find by the *Jumna's* Log that she had the usual fine and squally weather up to 3 A. M. on the 23rd, when it came on to blow from the N. West; and at 5, veered to West; at 6, to W. N. W.; and at $\frac{1}{2}$ past 8, to Noon it was N. N. W. and P. M. N. b. W.

Now the *Sultany* before, and up to Noon, had her Cyclone to the N. W. of her position, and though it is true that a storm circle which would include the *Braemar* and *Mary Stoddart*, both of which ships had a full hurricane on the 23rd, would also include the *Jumna's* position and run, yet it is difficult to allow so great a discrepancy in the position of the centre as denoted by the wind points shewn above; and this is farther strengthened by the fact that the winds on board the *Jumna*, though marked most carefully (nine times in the 24 hours on the 22nd, and twelve times in the Log of the 23rd), are never to the Eastward of North; which we certainly must suppose they would sometimes have been if the bearing of the centre had been so far to the North Westward of the *Jumna* as the *Sultany's* position, whether over or under-stated, shews. We may also remark that even at the calm centre and close upon it the *Jumna's* Log shews only vibrations of two points till the wind finally settled at S. W. after the shift.

Thus we are reduced to the first supposition, which is that the *Jumna* was bringing down with her another small Cyclone, and if we admit this, and that it was for a time travelling on a track gradually approaching her as shewn by the steady fall of her Barometer, we can easily understand that at the point where the two approximated and combined, the fury of the tempest might be much augmented and the track subject to some variation.† I proceed to examine the *Jumna's*

* Five points is not an excessive incurving of the wind when *near* the centre, but at this distance it would seem to be so. See Sailor's Horn Book, pp. 70 to 75, on the incurving of winds. The wind was of course accurately marked on board of the *Man-of-War*, and I do not recollect that we have any detailed Log of a *Man-of-War* in recent days in the Eastern Seas in an open Ocean. Those of H. M. S. in the China Seas cited in my Seventeenth Memoir are all within a short distance of the land.

† This certainly occurs with hail storms, as satisfactorily shewn by the Count de Tristan in the *Annales de la Société Royale d'Orléans*. See Quarterly Journal of Science for 1829, p. 214.

Log more closely so as clearly to set forth the reasons on which this opinion is founded. We shall find moreover that the *Braemar's* Cyclone was a separate one from those of the *Jumna* and *Sultany*.

First: we have her position at 3 A. M. of the 23rd as marked on the chart when it "came on to blow." The wind is marked at *N. W.* in the Log* and West at 5 A. M. though the copy of Lieut. Rodney's Admiralty letter forwarded to me by H. E. the Naval Commander-in-Chief, says "a heavy gale sprung up at *North*, veering at times to *N. N. W.*" This is, at starting, a troublesome discrepancy, but I reconcile it by supposing that *North West* was written at full length in the letter and the word *West* omitted by the copying clerks; for it is difficult to suppose that three copies of the Log by different hands are all in error. The wind is also marked *N. W.* from 9 P. M. to midnight on the 22nd. The Barometer at 29.64 at midnight 22nd and 29.57 at 3 A. M. 23rd; and the wind increasing from a force of 5 to 7 and 8.†

Hence we may say that the *Jumna* had a sudden onset of a fresh gale, at *N. W.*, giving her a centre bearing *S. W.* of her at 3 A. M.; which by 5, when she had run 27 miles to the South and *S. S. W.*, was bearing South of her (wind *West*) and in a run of 14.4 miles it was bearing *S. S. W.* of her, (wind *W. N. W.*) and in a run of 43 miles more, it was bearing *W. S. W.* of her, (wind *N. N. W.*)

We can only account for these excessive veerings by attributing them either to incurvings of the winds or to the action of a smaller Cyclone‡ travelling down with the ship, I prefer the latter hypothesis, and have therefore placed upon the chart a separate diagram upon a plane scale shewing the *Jumna's* run, and the various bearings of the Cyclone centre from her at different hours, with the height of her Barometer.

* Three copies in all.

† Admiral Beaufort's Numbers. 5 is a fresh breeze, 8 a fresh gale.

‡ Of which we may suppose the centre to have had that spiral motion upon itself during its progress described by Mr. Redfield, making thus the meandering track which I have laid down in the diagram; and even that these deviations from a direct line of track were occasioned by the alternate attractions and repulsions of the larger (*Sultany's* and *Braemar's*) Cyclones on each side of it, as with other electrified masses. It is evident that the three cannot be reconciled as one Cyclone till about the time of the *Jumna's* being dismasted. There is indeed one other, but a remote suspicion: namely, that her compasses may have been affected?

H. M. S. now ran down with the wind N. N. W. and N. b. W. till 4 P. M. when she reached the calm centre, but the Cyclone following her and probably before this time combining with the *Sultany's* and *Braemar's* gave her a renewed hurricane at W. S. W. and S. West, when unable to lie to any longer she bore up, with the wind now blowing harder than the figure 12 expresses, *though it had only been rated at 10 before the calm.* This average shift of N. N. W. to S. W. would give a track of E. S. E. for the body of the Cyclone at this time, though as compared with the position of the *Sultany*, not far from which one of the main Cyclones had certainly travelled down to reach the *Jumna's* here, the track should have been one from the N. W. b. N. to the S. E. b. S. so that if there was a junction of the three Cyclones as we have supposed, the track of the larger one was curved towards the smaller. The *Jumna* scudded before the S. W. hurricane till 10h. 45' P. M. when broaching to, she upset and was only saved from foundering by cutting away her mainmast. It is remarkable also that her Barometer was now lower, being at 29.16, than in the calm, when it was at 29.21. Was this an effect of the meeting of the *Braemar's* Cyclone?

The Cyclone *may* indeed have curved farther to the Eastward, as we shall now see on consideration of the *Braemar's* Log, which, I should premise, is one very well kept, and evidently worthy of all the credit which can be fairly accorded to a merchantman's Log in comparison with that of a Man-of-War. This ship then, on the 22nd at Noon, though her Barometer was still high had fresh gales at N. E. with drizzling rain and a high rolling sea, which was no doubt the commencement of her Cyclone, for at 8 it was "increasing with heavy seas* from the N. West, S. E. and S. W." obliging her to close reef; the Barometer having fallen to 29.54 by 4 P. M. and standing at 29.58 at midnight. Hence it would appear that she had at Noon a Cyclone to the N. W. b. N. of her (wind N. E. b. E.) and that at midnight its centre bore N. West of her, the wind being N. E., so that though she had run $46\frac{1}{2}$ miles S. S. W. and 37 miles South, the Cyclone had travelled down nearly with her like the *Jumna's*. I have projected these circles but in part only, so as not to interfere with those of the *Jumna's* track, though it must be recollected that at midnight 22nd and

* The precursor swells of the Cyclone.

23rd, the centre of the *Braemar's* Cyclone is about 100 miles to the South of the *Jumna's* probable position at the same time. And this too serves to shew that, like the *Jumna's* Cyclone, that of the *Braemar* was also of small extent, for had it been large it would have reached the *Jumna* at this time with its northern quadrants, giving her a N. Westerly gale of the same force; and that at noon of the 22nd the *Jumna* could not have been far from its centre if it had existed; whereas we find that she had at that time Northerly and variable winds (force 6) with cloudy weather, and it was not until 15 hours afterwards 3 A. M. 23rd, that it "came on to blow."

There can be no doubt, also, that the *Braemar's* Cyclone travelled down nearly with her, i. e. from the N. N. E. to the S. S. W.; for as from noon to midnight of the 22nd, she made a chord of 95 miles this would have given her a very considerable veering of the wind had the Cyclone been coming direct-towards her.*

At 8 A. M. there is the remarkable note in the *Braemar's* Log of "gale suddenly increasing," and the Barometer had fallen at Noon to 29.45, from 29.58 at midnight; and we find that at 9 A. M. the wind with the *Jumna* veered from W. N. W. to N. N. W. increasing in strength from 9 to 10. We may take this, I think, to be about the time of junction of the two, or of the three Cyclones, as that of the *Jumna* now seems to have adopted a steady course to the Southward as if it had been before attracted and repelled between the *Sultany's* and the *Braemar's*, which accounts for its serpentine track as shewn in our diagram. The land whirlwinds and simoons certainly make tracks of this kind, and in hail storms and thunder storms clouds are sometimes seen attracted and repelled between two others. So that on the supposition that the Cyclone is an electrical phenomenon, there is nothing at all strange in this track of the *Jumna's*, and we may think ourselves very fortunate that we have so many Logs and notices to explain it.

The main Cyclone evidently after this time, (Noon 23rd) passed to the Northward of the *Braemar*; which ship was probably carried

* A Cyclone of 100 miles in diameter requires in round numbers a run of 10 miles for each point which the wind veers; one of 200 miles about 20', so that the *Braemar's* Cyclone could only be travelling parallel to her, and at about her own rate.

first to the South Westward and then back to the Northward by her drift and the storm currents; being so near the centre as to have the wind veering from E. N. E. to S. E. blowing a hurricane at midnight when H. M. S. *Jumna* was also in the adjacent quadrant running out of the circle, with her foremast only standing since 10h. 45' P. M. From the direction of the wind—and taking also into account the little attention which *can* be paid to a merchantman's Log on the approach of bad weather, so that it is very often undermarked, it would seem that the *Braemar* must have been much farther to the Southward than her Lat. and Long. by D. R. place her, but I have not thought it right to alter her position on a mere probability. There can be no doubt that she was close on the Southern and S. Western quadrants of the centre both from the rapid veering of the wind and its extreme violence, obliging her at 3 A. M. of the 24th to cut away her mainmast.

From the Log of the *Mary Stoddart*, there is nothing to be gleaned except that she had also a Cyclone *thereabouts** travelling to the South Eastward. The notice of the *Ormelie* may relate either to a heavy Westerly monsoon gale or to the Northern quadrants of the *Mary Stoddart's* Cyclone.

As the phænomenon of the vibrating track of the *Jumna's* Cyclone as marked on the chart is of much importance in our science if we allow that it really took place as I have endeavoured to shew, I have thought it right to print also the Log at full length; or rather a Log compounded of the three separate ones in my possession by filling up in Lieut. Rodney's Log of the weather, Bar. and Ther. the distances. I have no Log enabling me to give the run on the 22nd, or afternoon of the 24th, but this is immaterial.

I have noted carefully where discrepancies occur, but fortunately in all the main points as regards the veerings of the wind they all agree, and it is this alone which is of interest to this part of the investigation. The remarks of the Log I have condensed with the abridgement in Part II.

* For, to add to our perplexities with these scant notices, some Captains give the Latitude and Longitude of their position when they consider the hurricane to have *begun* with them, and others their position when it is at its utmost fury; so that a hurricane in such a position means at either of the above times! and the two positions may be at any distance apart.

An extract from the Log of H. M.'s Brig "JUNNA," shewing the state of the weather, Barometer, and Thermometer between the 22nd and 24th April, 1848—from LIEUT. RODNEY, TRINCOMALEE: the distances on the 23rd and 24th, also from the official copy of the Log.

Hours.	Courses.	Winds.	Force.	Weather.	Bar.	Ther.	Saturday 22nd April, 1848.
1	South	Variable	3	c. n. e.	29.72	82°	A. M.
2			4	c. p.			
3			5	c. q. m.			
4			5	c. q. 8			
5			6	o. c. q. r.			
6	•	North		b. c. q.	29.73	82°	Squally.
7							
8							
9							
10							
11							
12							
1	S. W.	Variable	6	o. p.	29.62	82°	P. M.
2			6	o. r.			
3							
4							
5							
6	S. S. W. S. W. & W. S. S. W.	North	6	c. r.	29.66	83°	Very squally.
7			6	o. q.			
8							
9							
10							
11							
12			5	o. r.			

Hours.	Courses.	K. F.	Winds.	Force.	Weather.	Barometer.	Thermometer.	Sunday 23rd April, 1848.
1	S. S. W.	9 0	N. W.	6	c. q. r.	29.57	82°	A. M.
2		9 0						
3		9 0						
4	{ South	3 5		7				
5	{ S. S. W.	5 0	West	8				
6		9 4	W. N. W.*	9				
7		10 5						
8		12 0						
9		11 5	N. N. W.†	10	o. q. g. p.	29.53	82½°	
10		11 5						
11		10 0						
12		11 5				29.33	82°	
			Lat. D. R. 10° 28' S.			Long. D. R. 85° 00' E.		
1	- S. S. W.	13 0	N. b. W.	10	o. q. g.	29.33	82°	P. M.
2		13 0				29.31	82°	
3		10 8	N. N. W.	9	o. q. g.			
4	{ South	6 0	Calm	{ 7				
5		3 2	W. S. W.	6		29.21	82°	Wind increasing.
6	S. b. W.	6 0	West	7	o. q. r.			
7	{ S. b. E.	3 3		{ 6				
8		3 0	S. W.	9		29.19	82°	
9		3 0	W. b. S.	10		29.18	82°	
10	{ S. b. E.	2 2		{ 10	o. q. g.	29.16	82°	
	{ N. E.	5 0	S. W.					
		11 0		11		29.18	82°	
11		14 0		10	o. q. g.	29.16	82°	
12		14 0		12		29.16	81°	

* Wind W. N. W. is marked at 5, ½ past 5 and 6.

† Wind N. N. W. is marked at 9, 10 and 11 A. M.

Hours.	Winds.	K. F.	Courses.	Force. If weather.	Barometer.	Thermometer.	Monday 24th April, 1848.
1	S. W.	14	N. E.	12	29.16	81°	A. M.
2	S. W. b. S.	14	N. E. b. N.				
3		14			29.18	81°	
4	S. S. W.	14	N. N. E.	11	29.16	81°	
5	S. W.	5	N. E. b. E.	8	29.18	82°	
6		1	E. b. N.	6			
7		2		3	29.22	82°	
8		1		4	29.24	82°	
9		2	N. E.		29.27	82°	
10		1	N. N. E.		29.37	82°	
11		1			29.40	83°	
12		1	*	4	29.42	83°	
							P. M.
1	N. W.		N. b. E.	5			
2	W. N. W.						
3							
4					29.63	82°	
5	West		N. b. E.	1			
6			North				
7			N. b. E.	6	29.62	82°	
8							
9							
10							
11							
12	W. ½ S.		North.	1	29.71	82°	

* No farther distances are in my possession.

CONCLUSION. We may first remark here, as regards the practical part of the results, that in both the Cyclones of which we have investigated the tracks, the single one of the *Sir Howard Douglas* and the triple combination of those which I have for brevity's sake called the *Jumna's*, all the ships which suffered did so from their neglect or ignorance of the Laws of our Science, for they had nothing to do but to heave to for a few hours! And again, as if they had all been performing experiments for the instruction of their brother seamen, the whole of them in the first Cyclone, the *Sir Howard Douglas*, *Admiral Moorsom*, and *Polly*, ran into the Cyclone circle from the South, the fair S. E. wind of the South Western quadrants tempting them to do so; and all those in the other Cyclone were doing the same on the opposite quadrants of their Cyclones, and exactly from the same temptation. And this it will be observed was constantly done in the face of their falling Barometers! It is I know very difficult for seamen to bend their minds to the notion of "*throwing away a fair wind because they are AFRAID of a hurricane,*" but we might also urge upon them that they may be creditably afraid of the displeasure of owners and underwriters, and of ruin to their own prospects, when the Barometer so clearly warns them that mischief is impending.*

As regards the theoretic or rather the physical branch of our enquiries we have arrived here at some very curious facts.

First, the tracks from the N. Westward and N. Eastward are corroborated by and corroborate those of the H. C. S. *Orwell* and *Macqueen* in 12° S.; and 100° to 104° East in January and February, 1827, which I have laid down on the Chart of the Tracks of the Southern Indian Ocean in the Sailors' Horn Book, (marked *i.* and *f.*) as well as some others farther East in the Timor Sea, shewing that just on the

* The Ship *Sir Howard Douglas*, dismasted and with loss of rudder being bound to Bombay with a cargo of coals, got into Galle, from whence she again started for Bombay; but while endeavouring to get round by the Southern passage, her coals heated, 95 days after being wetted in the hurricane! and she bore up for Calcutta where she had of course to be docked. She then went to Moulmein for a cargo of timber, where Captain Ogilvy, whose mind, as I saw, was much depressed by his misfortunes, died. The ship I presume reached home in safety, but the accounts of the voyage must have shewn a fearful loss for some one. All this might have been avoided by heaving to, at 6 P. M. for 6 hours!

verge of the Westerly monsoon and trade wind limits, great variation in the tracks is to be looked for.

Next, the serpentine course of the *Jumna's* hurricane most remarkably approaches to what we have upon record in various works describing the tracks of Tornadoes and land-spouts or whirlwinds (many of them evidently electric by their effects) and hail-storms. And the Comte de Tristan* has satisfactorily shewn in treating of this last class of phænomena, and of thunder-storms, that their clouds attract and cause each other to deviate from their route; often appearing stronger afterwards. We require farther evidence to affirm *certainly* that this occurs with Cyclones, but there are now strong probabilities that it does; and our present knowledge will serve to put the careful seaman on his guard till more is obtained, and afford many suggestions for intelligent observers.

Finally: all this we see occurs in the Storm Tract to which I have so often and so earnestly drawn the attention of mariners navigating the Indian Seas, and in which indubitably so many fatal losses and so much damage have occurred. And it must be now, evident to the most reckless that no ship can be too well prepared which has to cross these dangerous latitudes.

* Annales de la Societé Royale d'Orleans, before quoted p.

ON THE DUST-STORMS OF INDIA. BY P. BADDELEY, Esq.

B. M. S., SURGEON ARTY. LAHORE.

(*From the Philosophical Magazine and Journal of August, 1850.*)

The Editor reprints this paper with great pleasure; not only as another of those triumphs of Indian research which have so often adorned the pages of the Journal, and so well demonstrated to the scientific world what the energy of English minds alone can perform, under all the discouragements and difficulties which the experimental sciences, particularly, must meet with at every step in a state of Society so peculiar as that of India, but moreover as a solution of a great meteorological problem which opens a new page of the Book of Nature in that vast and yet unwrought mine of science. We trust that Dr. Baddeley will continue his valuable researches in the great field which he has before him.—ED. JOUR.

Lahore, April 18, 1850.

GENTLEMEN,

I have only an hour or two to spare before the Indian mail leaves this, to give you a few notes regarding dust-storms, which are very prevalent in this part of India during the dry months of April, May and June, that is, before the setting in of the rainy season.

My observations on this subject have extended as far back as the hot weather of 1847, when I first came to Lahore, and the result is as follows :—Dust-storms are caused by spiral columns of the electric fluid passing from the atmosphere to the earth; they have an onward motion—a revolving motion, like revolving storms at sea—and a peculiar spiral motion from above downwards, like a corkscrew. It seems probable that in an extensive dust-storm there are many of these columns moving on together in the same direction; and during the continuance of the storm, many sudden gusts take place at intervals, during which time the electric tension is at its maximum. These storms hereabouts mostly commence from the north-west or west and in the course of an hour, more or less, they have nearly completed the circle, and have passed onwards.

Precisely the same phenomena, in kind, are observable in all cases of dust-storms: from the one of a few inches in diameter to those that extend for fifty miles and upwards, the phenomena are identical.

It is a curious fact that some of the smaller dust-storms occasionally seen in extensive and arid plains, both in the country and in Afghanistan above the Bolan Pass, called in familiar language “Devils,” are either stationary for a long time, that is, upwards of an hour,

or nearly so; and during the whole of this time the dust and minute bodies on the ground are kept whirling above into the air. In other cases these small dust-storms are seen slowly advancing, and when numerous, usually proceed in the same direction. Birds, kites and vultures, are often seen soaring high up, just above these spots, apparently following the direction of the column, as if enjoying it.* My idea is, that the phænomena connected with dust-storms are identical with those present in waterspouts and white squalls at sea, and revolving storms and tornadoes of all kinds; and that they originate from the same cause, viz. moving columns of electricity.

In 1847, at Lahore, being desirous of ascertaining the nature of dust-storms, I projected into the air an insulated copper wire on a bamboo on the top of my house, and brought the wire into my room, and connected it with a gold-leaf electrometer and a detached wire communicating with the earth. A day or two after, during the passage of a small dust-storm, I had the pleasure of observing the electric fluid passing in vivid sparks from one wire to another, and of course strongly affecting the electrometer. The thing was now explained; and since then I have by the same means observed at least sixty dust-storms of various sizes, all presenting the same phænomena in kind.

I have commonly observed that, towards the close of a storm of this kind, a fall of rain suddenly takes place, and instantly the stream of electricity ceases, or is much diminished; and when it continues, it seems only on occasions, when the storm is severe and continues for some time after. The barometer steadily rises throughout. In this part of the world, the fluctuation of the barometric column is very slight, seldom more than two or three tenths of an inch at a time.

The average height at Lahore is 1-180, corrected for temperature, indicating, I suppose, above 1150 feet above the level of the sea, taking 30 inches as the standard.

A large dust-storm is usually preceded by certain peculiarities in the dew-point, and the manner in which the particles of dew are deposited on the bulb of a thermometer. My mode of taking the dew-point is, to plunge a common thermometer in a little ice, let it run down 20° or

* They may be looking for prey, or involved in, and unable to fly out of, the invisible part of the electrified aerial column, of which the lower part only is visible to us by the dust raised.—ED. JOURNAL.

30°, take it out, wipe it dry, hold it up to the light, and observe the bright spot, and continue to wipe off the dew so long as it is deposited and dulls the bulb : at the instant it clears off mark the temperature. This I have compared frequently with Daniell's hygrometer, cooled by means of chloroform, and find them both correspond with the greatest accuracy.

This is a digression ; but I have no time to arrange, and must therefore put down my remarks as they occur to me.

The dew-point varies very much, but is usually many degrees below the temperature of the air, 20° to 50° or more.

It also varies according to the time of year. During November last the mean temperature of the dew-point was about 47°, that of the air about 71°.

In January 1850, dew-point 43°; in the air, 61°; and the mean temperature of self-registering thermometer 45°·4.

In February 1850, mean of dew-point 48°, and air 64°·5.

April 1850, mean temperature of dew-point so far, is about 60°, and the air 84°.

The sparks, or the stream of electricity, as it is seen passing from one wire to the other, is in some cases, and during high tension, doubled or trebled ; and is never straight, but invariably more or less crooked.

Various kinds of sparks are seen ; at times one end of the wire has a star ; and from the wire, when held just beyond striking distance, a brush is seen curved, which, when viewed through a lens, seems composed of a stream or curved brush of bright globules, like a shower of mercury.

The manner in which the electricity acts upon the dust and light bodies it meets with in its passage, is simple enough. I suppose the particles similarly electrified and mutually repulsive, and then, together with the whirling motion communicated to them, are whisked into the air. The same takes place when the electricity moves over water. The surface of the water becomes exposed to the electric agency ; and its particles, rendered mutually repulsive, are in the same way whirled into the air.

At sea the waterspout is thus formed. First of all is seen the cloud descending, and beneath may be observed the water in a cone, misty

and agitated; soon the cloud is seen to approach and join the latter, involving both extremities in one column having a spiral motion, and on it moves or continues stationary. The power of electricity in raising bodies, when combined with this peculiar whirling motion, will account for fish, &c. being carried up in its vortex and afterwards discharged to a distance on the earth. The motion of the dust-storm may be described by spinning a tee-totum on a drop of ink; and the way in which bodies are projected may be in like manner described, by letting fall a drop of ink on the centre of a tee-totum while spinning. In this case the particles of ink are thrown off at tangents ever varying, as the centre moves; and perhaps it will be found, that when these kind of storms pass through forests, trees uprooted are distributed something in this manner.

The violent dust-storms are by some supposed to commence at the foot of the hills. I cannot tell if this be the case or not, but should think that they do not necessarily do so, as many often originate in extensive arid plains; and the rarefaction of air, from great and long-continued heat, may be in some way connected with the exciting cause.

Some of them come on with great rapidity, as if at the rate of from 40 to 80 miles an hour. They occur at all hours, oftentimes near sunset.

The sky is clear, and not a breath moving; presently a low bank of clouds is seen in the horizon, which you are surprised you did not observe before; a few seconds have passed, and the cloud has half filled the hemisphere: and now there is no time to lose—it is a dust-storm, and helter-skelter every one rushes to get into the house in order to escape being caught in it.

The electric fluid continues to stream down the conducting wire unremittingly during the continuance of the storm, the sparks oftentimes upwards of an inch in length, and emitting a crackling sound; its intensity varying with the force of the storm, and, as before said, more intense during the gusts.

Many dust-storms occur at Lahore and in the Punjaub, generally during the hot and dry months, as many as seven and nine in one month.

One that occurred last year in the month of August seemed to have

come from the direction of Lica, on the Indus, to the west and by south of Lahore, and to have a north-easterly direction. An officer travelling, and at the distance of twenty miles or so from Lica, was suddenly caught in it; his tent was blown away, and he himself knocked down and nearly suffocated by the sand. He stated to me that he was informed by one resident at Lica, that so great was its force at the latter place, as to crack the walls of a substantial brick dwelling in which the above officer had lately resided, and to uproot some trees about.

The instant the insulated wire is involved in the electric current marked by the column of dust, down streams the electricity.

I have sometimes attempted to test the kind of electricity, and find that it is not invariably in the same state; sometimes appearing +, at other times -, and changing during the storm.

One day I caused the current to pass through a solution of cyanide of silver, so as to affect a small piece of copper, which was rapidly covered with a coating of silver, which upon drying peeled off. In this case the cyanide of silver was pure, without any salt; but in subsequent attempts to silver a wire in this way, I have not succeeded, only a very slight deposit taking place, which was not increased by long exposure to the influence.

But in all the cases I tried subsequent to the one first alluded to, the oxide of silver was dissolved in cyanide of potassium. In the course of time bright and minute crystals were formed, transparent and colourless, on a copper coin.

Yours truly,

P. BADDELEY,

Arty. Surgeon, Lahore.

*Tables for determining Heights by the Barometer. Computed by
Major J. C. HANNYNGTON, B. N. I.*

These tables are so framed as to bring the logarithmic process into a purely arithmetical and very simple form.

They are to be used as follows :

Rule. Correct the Barometer at the colder station, by adding the correction from Table I. for the *difference* of temperature.

Extract the Barometric Factors from Table II., then according as the Barometer at the *lower* station is more or less than 30 inches, multiply the sum or difference of these Factors, by the Factor for the *sum* of the temperatures from Table III. The result will be the difference of altitude in feet.

Where great accuracy is desired a small correction for the approximate Latitude of the place may be applied from Table IV. This is to be added to or taken from the computed height, according as the Latitude is less or more than 45°.

		<i>Thermometers,</i>	
		<i>Barometers.</i>	<i>attached. detached.</i>
Example I.	Calcutta,	30.131	87 . 86
	Hazaribagh,	28.019	78 . 77
			Diff. 9 Sum 163
	Barometer at the <i>colder</i> station, . .	28.019	
	Correction Table I. for Bar. 28,		
	and Diff. 9, . . . . .	.028	
		28.047	Factor Table II. 29.23
	Barometer Calcutta,	30.131	,, 1.89
			Sum of the Factors, 31.12
	Sum of Thermometer 163°. Factor from Table III.		66.98
			24896
			28008
			18672
			18672
			Product, Hazaribagh above Calcutta, in feet, 2084.4176

Here it will be observed that the Barometer at the *lower* station exceeds 30 inches; therefore the *sum* of the Barometric Factors is used. The Latitude of Hazaribagh being 24° and the elevation 2000 feet, it appears from Table IV. that 3 feet may be *added* to the above result.

		<i>Thermometers.</i>	
		<i>Barometers.</i>	<i>attached, detached.</i>
Example II.	Lake,	29.950	50 49
	Mountain,	27.474	44 45
			<hr/>
		Diff.	6 Sum 94
			<hr/>
Barometer <i>colder</i> station,		27.474	
Correction for 6° Tab. I. . . . .		.017	
		<hr/>	
		27.491	Factor Tab. II. 37.93
Lake,		29.950	„ 0.72
			<hr/>
		Difference of the Factors,	37.21
Sum of Thermometers 94° .		Factor Tab. III. . .	62.36
			<hr/>
			22326
			11163
			7442
			22326
			<hr/>
Product, difference of altitude in feet,			2320.4156

Here the Barometer at the *lower* station is *less* than 30 inches, therefore the *difference* of the Barometric Factors is used. The Latitude being 55° it appears from Table IV., that 2 feet may be subtracted from the above result.

Note on the construction of the Tables.

Let T and T' be the temperatures of the mercury ; t and t' those of the air, h and h' the heights (after reduction by Tab. I.) of the Barometers, at the lower and upper stations, and λ the latitude of the place. Also let H express inches of the Barometrical column generally ; then,

Table I. $H \frac{T - T'}{9600}$, being the correction of the Barometer for the expansion or contraction of mercury, depending on temperature. Which correction, being applied to the *colder* Barometer, is additive.

Table II. 1000 (209 30—209 H), and consequently the sum or difference of the tabular quantities taken for h and h' is equivalent to 1000 (209 h—209 h') ; five figure logarithms being used.

Table III. $60.345 \left(1 \pm \frac{t + t' - 64}{900} \right)$.

Table IV. $.002695 \cos 2 \lambda$.

The result of the tables is therefore,

Difference of
level in feet, $\left. \begin{array}{l} \text{ } \\ \text{ } \end{array} \right\} \frac{60345}{1 \pm .002695 \cos 2 \lambda} \left(1 \pm \frac{t + t' - 64}{900} \right)$
(209 h—209 h').

TABLE I.—Correction of the Barometer for temperature.

Difference of the Thermometers.	Barometer Inches.									Difference of the Thermometers.
	14	15	16	17	18	19	20	21	22	
	Correction to be added to the colder or subtracted from the warmer Barometer.									
0	.000	.000	.000	.000	.000	.000	.000	.000	.000	0
1	.001	.002	.002	.002	.002	.002	.002	.002	.002	1
2	.003	.003	.003	.004	.004	.004	.004	.004	.005	2
3	.004	.005	.005	.005	.006	.006	.006	.007	.007	3
4	.006	.006	.007	.007	.008	.008	.008	.009	.009	4
5	.007	.008	.008	.009	.009	.010	.010	.011	.011	5
6	.009	.009	.010	.011	.011	.012	.012	.013	.014	6
7	.010	.011	.012	.012	.013	.014	.015	.015	.016	7
8	.012	.013	.013	.014	.015	.016	.017	.017	.018	8
9	.013	.014	.015	.016	.017	.018	.019	.020	.021	9
10	.015	.016	.017	.018	.019	.020	.021	.022	.023	10
11	.016	.017	.018	.019	.021	.022	.023	.024	.025	11
12	.017	.019	.020	.021	.023	.024	.025	.026	.027	12
13	.019	.020	.022	.023	.024	.026	.027	.028	.030	13
14	.020	.022	.023	.025	.026	.028	.029	.031	.032	14
15	.022	.023	.025	.027	.028	.030	.031	.033	.034	15
16	.023	.025	.027	.028	.030	.032	.033	.035	.036	16
17	.025	.027	.028	.030	.032	.034	.035	.037	.039	17
18	.026	.028	.030	.032	.034	.036	.037	.039	.042	18
19	.028	.030	.032	.034	.036	.038	.040	.042	.044	19
20	.029	.031	.033	.035	.038	.040	.042	.044	.046	20
21	.031	.033	.035	.037	.039	.042	.044	.046	.048	21
22	.032	.034	.037	.039	.041	.044	.046	.048	.050	22
23	.034	.036	.038	.041	.043	.046	.048	.050	.053	23
24	.035	.038	.040	.042	.045	.048	.050	.052	.055	24
25	.036	.039	.042	.044	.047	.049	.052	.055	.057	25
26	.038	.041	.043	.046	.049	.051	.054	.057	.060	26
27	.039	.042	.045	.048	.051	.053	.056	.059	.062	27
28	.041	.044	.047	.050	.053	.055	.058	.061	.064	28
29	.042	.045	.048	.051	.054	.057	.060	.063	.066	29

TABLE I.—(Continued.)

Difference of the Thermometers.	Barometer Inches.									Difference of the Thermometers.
	14	15	16	17	18	19	20	21	22	
	Correction to be added to the colder or subtracted from the warmer Barometer.									
30	.044	.047	.050	.053	.056	.059	.062	.066	.069	30
31	.045	.048	.052	.055	.058	.061	.065	.068	.071	31
32	.047	.050	.053	.057	.060	.063	.067	.070	.073	32.
33	.048	.052	.055	.058	.062	.065	.069	.072	.076	33
34	.050	.053	.057	.060	.064	.067	.071	.074	.078	34
35	.051	.055	.058	.062	.066	.069	.073	.077	.080	35
36	.052	.056	.060	.064	.068	.071	.075	.079	.083	36
37	.054	.058	.062	.065	.069	.073	.077	.081	.085	37
38	.055	.059	.063	.067	.071	.075	.079	.083	.087	38
39	.057	.061	.065	.069	.073	.077	.081	.085	.089	39
40	.058	.062	.067	.071	.075	.079	.083	.087	.091	40
41	.060	.064	.068	.073	.077	.081	.085	.090	.094	41
42	.061	.066	.070	.074	.079	.083	.087	.092	.097	42
43	.063	.067	.072	.076	.081	.085	.090	.094	.099	43
44	.064	.069	.073	.078	.083	.087	.092	.096	.101	44
45	.066	.070	.075	.080	.084	.089	.094	.098	.103	45
46	.067	.072	.077	.081	.086	.091	.096	.101	.105	46
47	.069	.074	.078	.083	.088	.093	.098	.103	.108	47
48	.070	.075	.080	.085	.090	.095	.100	.105	.110	48
49	.071	.077	.082	.087	.092	.097	.102	.107	.112	49
50	.073	.078	.083	.089	.094	.099	.104	.109	.115	50
51	.074	.080	.085	.090	.096	.101	.106	.112	.117	51
52	.076	.081	.087	.092	.098	.103	.108	.114	.119	52
53	.077	.083	.088	.094	.099	.105	.110	.116	.121	53
54	.079	.084	.090	.096	.101	.107	.112	.118	.124	54
55	.080	.086	.092	.097	.103	.109	.115	.120	.126	55
56	.082	.087	.093	.099	.105	.111	.117	.122	.128	56
57	.083	.089	.095	.101	.107	.113	.119	.125	.131	57
58	.085	.091	.097	.103	.109	.115	.121	.127	.133	58
59	.086	.092	.098	.104	.111	.117	.123	.129	.135	59

TABLE I.—(Continued.)

Difference of the Thermometers.	Barometer Inches.									Difference of the Thermometers.
	23	24	25	26	27	28	29	30	31	
	Correction to be added to the colder or subtracted from the warmer Barometer.									
0	.000	.000	.000	.000	.000	.000	.000	.000	.000	0
1	.002	.003	.003	.003	.003	.003	.003	.003	.003	1
2	.005	.005	.005	.005	.006	.006	.006	.006	.006	2
3	.007	.008	.008	.008	.008	.009	.009	.009	.010	3
4	.010	.010	.010	.011	.011	.012	.012	.013	.013	4
5	.012	.013	.013	.014	.014	.015	.015	.016	.016	5
6	.014	.015	.016	.016	.017	.018	.018	.019	.019	6
7	.017	.018	.018	.019	.020	.020	.021	.022	.023	7
8	.019	.020	.021	.022	.022	.023	.024	.025	.026	8
9	.022	.023	.023	.024	.025	.026	.027	.028	.029	9
10	.024	.025	.026	.027	.028	.029	.030	.031	.032	10
11	.026	.028	.029	.030	.031	.032	.033	.034	.036	11
12	.029	.030	.031	.032	.034	.035	.036	.038	.039	12
13	.031	.033	.034	.035	.036	.038	.039	.041	.042	13
14	.034	.035	.036	.038	.039	.041	.042	.044	.045	14
15	.036	.038	.039	.041	.042	.044	.045	.047	.048	15
16	.038	.040	.042	.043	.045	.047	.048	.050	.052	16
17	.041	.043	.044	.046	.048	.050	.051	.053	.055	17
18	.043	.045	.047	.049	.051	.053	.054	.056	.058	18
19	.046	.048	.049	.051	.053	.055	.057	.059	.061	19
20	.048	.050	.052	.054	.056	.058	.060	.063	.065	20
21	.050	.053	.055	.057	.059	.061	.063	.066	.068	21
22	.053	.055	.057	.060	.062	.064	.066	.069	.071	22
23	.055	.058	.060	.062	.065	.067	.069	.072	.074	23
24	.058	.060	.062	.065	.067	.070	.073	.075	.077	24
25	.060	.063	.065	.068	.070	.073	.076	.078	.081	25
26	.062	.065	.068	.070	.073	.076	.079	.081	.084	26
27	.065	.068	.070	.073	.076	.079	.082	.084	.087	27
28	.067	.070	.073	.076	.079	.082	.085	.088	.090	28
29	.070	.073	.075	.079	.081	.085	.088	.091	.094	29

TABLE I.—(Continued.)

Difference of the Thermometers.	Barometer Inches.									Difference of the Thermometers.
	23	24	25	26	27	28	29	30	31	
	Correction to be added to the colder or subtracted from the warmer Barometer.									
30	.072	.075	.078	.081	.084	.088	.091	.094	.097	30
31	.074	.078	.081	.084	.087	.090	.094	.097	.100	31
32	.077	.080	.083	.087	.090	.093	.097	.100	.103	32.
33	.079	.083	.086	.089	.093	.096	.100	.103	.106	33
34	.081	.085	.088	.092	.096	.099	.103	.106	.110	34
35	.084	.088	.091	.095	.098	.102	.106	.109	.113	35
36	.086	.090	.094	.097	.101	.105	.109	.113	.116	36
37	.089	.093	.096	.100	.104	.108	.112	.116	.119	37
38	.091	.095	.099	.103	.107	.111	.115	.119	.123	38
39	.093	.098	.101	.106	.110	.114	.118	.122	.126	39
40	.096	.100	.104	.108	.112	.117	.121	.125	.129	40
41	.098	.103	.107	.111	.115	.120	.124	.128	.132	41
42	.101	.105	.109	.114	.118	.123	.127	.131	.136	42
43	.103	.108	.112	.116	.121	.125	.130	.134	.139	43
44	.105	.110	.114	.119	.124	.128	.133	.138	.142	44
45	.108	.113	.117	.122	.126	.131	.136	.141	.145	45
46	.110	.115	.120	.125	.129	.134	.139	.144	.148	46
47	.113	.118	.122	.127	.132	.137	.142	.147	.152	47
48	.115	.120	.125	.130	.135	.140	.145	.150	.155	48
49	.117	.123	.127	.133	.138	.143	.148	.153	.158	49
50	.120	.125	.130	.135	.141	.146	.151	.156	.161	50
51	.122	.128	.133	.138	.143	.149	.154	.159	.165	51
52	.125	.130	.135	.141	.146	.152	.157	.163	.168	52
53	.127	.133	.138	.144	.149	.155	.160	.166	.171	53
54	.129	.135	.140	.146	.152	.158	.163	.169	.174	54
55	.132	.138	.143	.149	.155	.160	.166	.172	.177	55
56	.134	.140	.146	.152	.157	.163	.169	.175	.181	56
57	.137	.143	.148	.154	.160	.166	.172	.178	.184	57
58	.139	.145	.151	.157	.163	.169	.173	.181	.187	58
59	.141	.148	.153	.160	.166	.172	.178	.184	.190	59

TABLE II.—Factor of the Barometers.

Barometer fourteen Inches.				Barometer fifteen Inches.			
Inches.	Factor.	Inches.	Factor.	Inches.	Factor.	Inches.	Factor.
14.00	330.99	14.50	315.75	15.00	301.03	15.50	286.79
.01	.68	.51	.45	.01	300.74	.51	.51
.02	.37	.52	.15	.02	.45	.52	.23
.03	.06	.53	314.85	.03	.16	.53	285.95
.04	329.75	.54	.56	.04	299.87	.54	.67
.05	.44	.55	.26	.05	.58	.55	.39
.06	.13	.56	313.96	.06	.29	.56	.11
.07	328.83	.57	.66	.07	.01	.57	284.83
.08	.52	.58	.36	.08	298.72	.58	.55
.09	.21	.59	.06	.09	.43	.59	.27
14.10	327.90	14.60	312.77	15.10	298.14	15.60	284.00
.11	.59	.61	.47	.11	297.86	.61	283.72
.12	.29	.62	.17	.12	.57	.62	.44
.13	326.98	.63	311.88	.13	.28	.63	.16
.14	.67	.64	.58	.14	296.99	.64	282.88
.15	.36	.65	.28	.15	.71	.65	.61
.16	.06	.66	310.99	.16	.42	.66	.33
.17	325.75	.67	.69	.17	.13	.67	.05
.18	.44	.68	.39	.18	295.85	.68	281.77
.19	.14	.69	.10	.19	.56	.69	.50
14.20	324.83	14.70	309.80	15.20	295.28	15.70	281.22
.21	.53	.71	.51	.21	294.99	.71	280.94
.22	.22	.72	.21	.22	.71	.72	.67
.23	323.92	.73	308.92	.23	.42	.73	.39
.24	.61	.74	.62	.24	.13	.74	.12
.25	.31	.75	.33	.25	293.85	.75	279.84
.26	.00	.76	.03	.26	.57	.76	.56
.27	322.70	.77	307.74	.27	.28	.77	.29
.28	.39	.78	.45	.28	.00	.78	.01
.29	.09	.79	.15	.29	292.71	.79	278.74

TABLE II.—(Continued.)

Barometer fourteen Inches.				Barometer fifteen Inches.			
Inches.	Factor.	Inches.	Factor.	Inches.	Factor.	Inches.	Factor.
14.30	321.78	14.80	306.86	15.30	292.43	15.80	278.46
.31	.48	.81	.56	.31	.14	.81	.19
.32	.18	.82	.27	.32	291.86	.82	277.91
.33	320.87	.83	305.98	.33	.58	.83	.64
.34	.57	.84	.69	.34	.29	.84	.36
.35	.27	.85	.39	.35	.01	.85	.09
.36	319.97	.86	.10	.36	290.73	.86	276.82
.37	.66	.87	304.81	.37	.45	.87	.54
.38	.36	.88	.52	.38	.16	.88	.27
.39	.06	.89	.23	.39	289.88	.89	.00
14.40	318.76	14.90	303.93	15.40	289.60	15.90	275.72
.41	.46	.91	.64	.41	.32	.91	.45
.42	.15	.92	.35	.42	.04	.92	.18
.43	317.85	.93	.06	.43	288.75	.93	274.90
.44	.55	.94	302.77	.44	.47	.94	.63
.45	.25	.95	.48	.45	.19	.95	.36
.46	316.95	.96	.19	.46	287.91	.96	.09
.47	.65	.97	301.90	.47	.63	.97	273.82
.48	.35	.98	.61	.48	.35	.98	.54
.49	.05	.99	.32	.49	.07	.99	.27

Proportional parts for thousandths of inches.

Inches.	.001	.002	.003	.004	.005	.006	.007	.008	.009
Diff, .31	.03	.06	.09	.12	.16	.19	.22	.25	.28
„ .30	.03	.06	.09	.12	.15	.18	.21	.24	.27
„ .29	.03	.06	.09	.12	.15	.17	.20	.23	.26
„ .28	.03	.06	.08	.11	.14	.17	.20	.22	.25
„ .27	.03	.05	.08	.11	.14	.16	.19	.22	.24

TABLE II.—(Continued.)

Barometer Sixteen Inches.				Barometer Seventeen Inches.			
Inches.	Factor.	Inches.	Factor.	Inches.	Factor.	Inches.	Factor.
16.00	273.00	16.50	259.64	17.00	246.67	17.50	234.08
.01	272.73	.51	.37	.01	.42	.51	233.83
.02	.46	.52	.11	.02	.16	.52	.59
.03	.19	.53	258.85	.03	245.91	.53	.34
.04	271.92	.54	.58	.04	.65	.54	.09
.05	.64	.55	.32	.05	.40	.55	232.84
.06	.37	.56	.06	.06	.14	.56	.60
.07	.10	.57	257.80	.07	244.89	.57	.35
.08	270.83	.58	.54	.08	.63	.58	.10
.09	.56	.59	.27	.09	.38	.59	231.85
16.10	270.29	16.60	257.01	17.10	244.12	17.60	231.61
.11	.02	.61	256.75	.11	243.87	.61	.36
.12	269.75	.62	.49	.12	.62	.62	.11
.13	.49	.63	.23	.13	.36	.63	230.87
.14	.22	.64	255.97	.14	.11	.64	.62
.15	268.95	.65	.71	.15	242.86	.65	.38
.16	.68	.66	.44	.16	.60	.66	.13
.17	.41	.67	.18	.17	.35	.67	229.88
.18	.14	.68	254.92	.18	.10	.68	.64
.19	267.87	.69	.66	.19	241.84	.69	.39
16.20	267.60	16.70	254.40	17.20	241.59	17.70	229.15
.21	.34	.71	.14	.21	.64	.71	228.90
.22	.07	.72	253.88	.22	.09	.72	.66
.23	266.80	.73	.62	.23	240.83	.73	.41
.24	.53	.74	.36	.24	.58	.74	.17
.25	.27	.75	.11	.25	.33	.75	227.92
.26	.00	.76	252.85	.26	.08	.76	.68
.27	265.73	.77	.59	.27	239.83	.77	.43
.28	.47	.78	.33	.28	.58	.78	.19
.29	.20	.79	.07	.29	.32	.79	226.94

TABLE II.—(Continued.)

Barometer Sixteen Inches.				Barometer Seventeen Inches.			
Inches.	Factor.	Inches.	Factor.	Inches.	Factor.	Inches.	Factor.
16.30	264.93	16.80	251.81	17.30	239.07	17.80	226.70
.31	.67	.81	.55	.31	238.82	.81	.46
.32	.40	.82	.29	.32	.57	.82	.21
.33	.13	.83	.04	.33	.32	.83	225.97
.34	263.87	.84	250.78	.34	.07	.84	.73
.35	.60	.85	.52	.35	237.82	.85	.48
.36	.34	.86	.26	.36	.57	.86	.24
.37	.07	.87	.00	.37	.32	.87	.00
.38	262.81	.88	249.75	.38	.07	.88	224.75
.39	.54	.89	.49	.39	236.82	.89	.51
16.40	262.28	16.90	249.23	17.40	236.57	17.90	224.27
.41	.01	.91	248.98	.41	.32	.91	.02
.42	261.75	.92	.72	.42	.07	.92	223.78
.43	.48	.93	.46	.43	235.82	.93	.54
.44	.22	.94	.21	.44	.57	.94	.30
.45	260.97	.95	247.95	.45	.32	.95	.06
.46	.69	.96	.69	.46	.08	.96	222.81
.47	.43	.97	.44	.47	234.83	.97	.57
.48	.16	.98	.18	.48	.58	.98	.33
.49	259.90	.99	246.93	.49	.32	.99	.09

Proportional parts for thousandths of inches.

Inches.	.001	.002	.003	.004	.005	.006	.007	.008	.009
Diff.	.28	.03	.06	.08	.11	.14	.17	.20	.22
„	.27	.03	.05	.08	.11	.14	.16	.19	.22
„	.26	.03	.05	.08	.10	.13	.16	.18	.21
„	.25	.03	.05	.08	.10	.13	.15	.18	.20
„	.24	.03	.05	.07	.10	.12	.14	.17	.19

TABLE II.—(Continued.)

Barometer Eighteen Inches.				Barometer Nineteen Inches.			
Inches.	Factor.	Inches.	Factor.	Inches.	Factor.	Inches.	Factor.
18.00	221.85	18.30	214.67	19.00	198.37	19.30	191.56
.01	.61	.31	.43	.01	.14	.31	.34
.02	.37	.32	.19	.02	197.91	.32	.11
.03	.12	.33	213.96	.03	.68	.33	190.89
.04	220.88	.34	.72	.04	.45	.34	.66
.05	.64	.35	.48	.05	.22	.35	.44
.06	.40	.36	.25	.06	.00	.36	.21
.07	.16	.37	.01	.07	196.77	.37	189.99
.08	219.92	.38	212.77	.08	.54	.38	.77
.09	.68	.39	.54	.09	.31	.39	.54
18.10	219.44	18.40	212.30	19.10	196.09	19.40	189.32
.11	.20	.41	.07	.11	195.86	.41	.09
.12	218.96	.42	211.83	.12	.63	.42	188.87
.13	.72	.43	.59	.13	.40	.43	.65
.14	.48	.44	.36	.14	.18	.44	.42
.15	.24	.45	.12	.15	194.95	.45	.20
.16	.00	.46	210.89	.16	.72	.46	187.98
.17	217.77	.47	.65	.17	.50	.47	.75
.18	.53	.48	.42	.18	.27	.48	.53
.19	.29	.49	.18	.19	.04	.49	.31
18.20	217.05	18.50	209.95	19.20	193.82	19.50	187.09
.21	216.81	.51	.71	.21	.59	.51	186.86
.22	.57	.52	.48	.22	.37	.52	.64
.23	.33	.53	.24	.23	.14	.53	.42
.24	.10	.54	.01	.24	192.91	.54	.20
.25	215.86	.55	208.78	.25	.69	.55	185.97
.26	.62	.56	.54	.26	.46	.56	.75
.27	.38	.57	.31	.27	.24	.57	.53
.28	.14	.58	.07	.28	.01	.58	.31
.29	214.91	.59	207.84	.29	191.79	.59	.09

TABLE II.—(Continued.)

Barometer Eighteen Inches.				Barometer Nineteen Inches.			
Inches.	Factor.	Inches.	Factor.	Inches.	Factor.	Inches.	Factor.
18.60	207.61	18.80	202.96	19.60	184.86	19.80	180.46
.61	.37	.81	.73	.61	.64	.81	.24
.62	.14	.82	.50	.62	.42	.82	.02
.63	206.91	.83	.27	.63	.20	.83	179.80
.64	.67	.84	.04	.64	183.98	.84	.58
.65	.44	.85	201.81	.65	.76	.85	.36
.66	.21	.86	.58	.66	.54	.86	.14
.67	205.98	.87	.35	.67	.32	.87	178.92
.68	.74	.88	.12	.68	.09	.88	.70
.69	.51	.89	200.89	.69	182.87	.89	.49
18.70	205.28	18.90	200.66	19.70	182.65	19.90	178.27
.71	.05	.91	.43	.71	.43	.91	.05
.72	204.81	.92	.20	.72	.21	.92	177.83
.73	.58	.93	199.97	.73	181.92	.93	.61
.74	.35	.94	.74	.74	.77	.94	.39
.75	.12	.95	.51	.75	.55	.95	.18
.76	203.89	.96	.28	.76	.33	.96	176.96
.77	.66	.97	.05	.77	.11	.97	.74
.78	.42	.98	198.82	.78	180.89	.98	.52
.79	.19	.99	.59	.79	.67	.99	.31

Proportional parts for thousandths of inches.

Inches.		.001	.002	.003	.004	.005	.006	.007	.008	.009
Diff.	25.	.03	.05	.08	.10	.13	.15	.18	.20	.23
"	24.	.03	.05	.07	.10	.12	.14	.17	.19	.22
"	23.	.02	.05	.07	.09	.12	.14	.16	.18	.21
"	22.	.02	.04	.07	.09	.11	.13	.15	.18	.20
"	21.	.02	.04	.06	.08	.11	.13	.15	.17	.19

TABLE II.—(Continued.)

Barometer Twenty Inches.				Barometer Twenty-one Inches.			
Inches.	Factor.	Inches.	Factor.	Inches.	Factor.	Inches.	Factor.
20.00	176.09	20.30	169.62	21.00	154.90	21.30	148.74
.01	175.87	.31	.41	.01	.69	.31	.54
.02	.66	.32	.20	.02	.49	.32	.33
.03	.44	.33	168.98	.03	.28	.33	.13
.04	.22	.34	.77	.04	.07	.34	147.93
.05	.01	.35	.56	.05	153.87	.35	.73
.06	174.79	.36	.34	.06	.66	.36	.62
.07	.57	.37	.13	.07	.46	.37	.32
.08	.36	.38	167.92	.08	.25	.38	.11
.09	.14	.39	.70	.09	.04	.39	146.91
20.10	173.92	20.40	167.49	21.10	152.84	21.40	146.71
.11	.71	.41	.28	.11	.63	.41	.50
.12	.49	.42	.06	.12	.43	.42	.30
.13	.28	.43	166.85	.13	.22	.43	.10
.14	.06	.44	.64	.14	.01	.44	145.90
.15	172.84	.45	.43	.15	151.81	.45	.69
.16	.63	.46	.21	.16	.60	.46	.49
.17	.41	.47	.00	.17	.40	.47	.29
.18	.20	.48	165.79	.18	.19	.48	.09
.19	171.98	.49	.68	.19	150.99	.49	144.88
20.20	171.77	20.50	165.37	21.20	150.78	21.50	144.68
.21	.55	.51	.15	.21	.58	.51	.48
.22	.34	.52	164.94	.22	.37	.52	.28
.23	.12	.53	.73	.23	.17	.53	.08
.24	170.91	.54	.52	.24	149.97	.54	143.87
.25	.69	.55	.31	.25	.76	.55	.67
.26	.48	.56	.10	.26	.56	.56	.47
.27	.27	.57	163.89	.27	.35	.57	.27
.28	.05	.58	.67	.28	.15	.58	.07
.29	169.84	.59	.46	.29	148.94	.59	142.87

TABLE II.—(Continued.)

Barometer Twenty Inches.				Barometer Twenty-one Inches.			
Inches.	Factor.	Inches.	Factor.	Inches.	Factor.	Inches.	Factor.
20.60	163.25	20.80	159.06	21.60	142.67	21.80	138.66
.61	.04	.81	158.85	.61	.47	.81	.46
.62	162.83	.82	.64	.62	.26	.82	.27
.63	.62	.83	.43	.63	.06	.83	.07
.64	.41	.84	.22	.64	141.86	.84	137.87
.65	.20	.85	.01	.65	.66	.85	.67
.66	161.99	.86	157.81	.66	.46	.86	.47
.67	.73	.87	.60	.67	.26	.87	.27
.68	.57	.88	.39	.68	.06	.88	.07
.69	.36	.89	.18	.69	140.86	.89	136.87
20.70	161.15	20.90	156.97	21.70	140.66	21.90	136.68
.71	160.94	.91	.77	.71	.46	.91	.48
.72	.73	.92	.56	.72	.26	.92	.28
.73	.52	.93	.35	.73	.06	.93	.08
.74	.31	.94	.14	.74	139.86	.94	135.88
.75	.10	.95	155.94	.75	.66	.95	.69
.76	159.89	.96	.73	.76	.46	.96	.49
.77	.68	.97	.52	.77	.26	.97	.29
.78	.47	.98	.31	.78	.06	.98	.09
.79	.27	.99	.11	.79	138.86	.99	134.89

Proportional parts for thousandths of inches.

Inches.		.001	.002	.003	.004	.005	.006	.007	.008	.009
Diff.	.22	.02	.04	.07	.09	.11	.13	.15	.18	.20
„	.21	.02	.04	.06	.08	.11	.13	.15	.17	.19
„	.20	.02	.04	.06	.08	.10	.12	.14	.16	.18
„	.19	.02	.04	.06	.08	.10	.11	.13	.15	.17

TABLE II.—(Continued.)

Barometer Twenty-two Inches.				Barometer Twenty-three Inches.			
Inches.	Factor.	Inches	Factor.	Inches.	Factor.	Inches.	Factor.
22.00	134.70	22.30	128.82	23.00	115.39	23.30	109.76
.01	.50	.31	.62	.01	.20	.31	.58
.02	.30	.32	.43	.02	.01	.32	.39
.03	.11	.33	.23	.03	114.83	.33	.21
.04	133.91	.34	.04	.04	.64	.34	.02
.05	.71	.35	127.84	.05	.45	.35	108.83
.06	.51	.36	.65	.06	.26	.36	.65
.07	.32	.37	.45	.07	.07	.37	.46
.08	.12	.38	.26	.08	113.88	.38	.28
.09	132.92	.39	.07	.09	.70	.39	.09
22.10	132.73	22.40	126.87	23.10	113.51	23.40	107.90
.11	.53	.41	.68	.11	.32	.41	.72
.12	.33	.42	.48	.12	.13	.42	.53
.13	.14	.43	.29	.13	112.94	.43	.35
.14	131.94	.44	.10	.14	.76	.44	.16
.15	.75	.45	125.90	.15	.57	.45	106.98
.16	.55	.46	.71	.16	.38	.46	.79
.17	.35	.47	.52	.17	.19	.47	.61
.18	.16	.48	.32	.18	.01	.48	.42
.19	130.96	.49	.13	.19	111.82	.49	.24
22.20	130.77	22.50	124.94	23.20	111.63	23.50	106.05
.21	.57	.51	.74	.21	.44	.51	105.87
.22	.38	.52	.55	.22	.26	.52	.68
.23	.18	.53	.36	.23	.07	.53	.50
.24	129.99	.54	.17	.24	110.88	.54	.31
.25	.79	.55	123.97	.25	.70	.55	.13
.26	.59	.56	.78	.26	.51	.56	104.94
.27	.40	.57	.59	.27	.32	.57	.76
.28	.20	.58	.40	.28	.14	.58	.58
.29	.01	.59	.20	.29	109.95	.59	.39

TABLE II.—(Continued.)

Barometer Twenty-two Inches.				Barometer Twenty-three Inches.			
Inches.	Factor.	Inches.	Factor.	Inches.	Factor.	Inches.	Factor.
22.60	123.01	22.80	119.19	23.60	104.21	23.80	100.54
.61	122.82	.81	118.99	.61	.02	.81	.36
.62	.63	.82	.80	.62	103.84	.82	.18
.63	.44	.83	.61	.63	.66	.83	.00
.64	.24	.84	.42	.64	.47	.84	99.81
.65	.05	.85	.23	.65	.29	.85	.63
.66	121.86	.86	.04	.66	.11	.86	.45
.67	.67	.87	117.85	.67	102.92	.87	.27
.68	.48	.88	.66	.68	.74	.88	.09
.69	.29	.89	.47	.69	.55	.89	98.90
22.70	121.09	22.90	117.28	23.70	102.37	23.90	98.72
.71	120.90	.91	.09	.71	.19	.91	.54
.72	.71	.92	116.91	.72	.01	.92	.36
.73	.52	.93	.72	.73	101.82	.93	.18
.74	.33	.94	.53	.74	.63	.94	.00
.75	.14	.95	.34	.75	.44	.95	97.81
.76	119.95	.96	.15	.76	.26	.96	.63
.77	.76	.97	115.96	.77	.07	.97	.45
.78	.57	.98	.77	.78	100.99	.98	.27
.79	.38	.99	.58	.79	.71	.99	.09

Proportional parts for thousandths of inches.

Inches.		.001	.002	.003	.004	.005	.006	.007	.008	.009
Diff.	.20	.02	.04	.06	.08	.10	.12	.14	.16	.18
"	.19	.02	.04	.06	.08	.10	.11	.13	.15	.17
"	.18	.02	.04	.05	.07	.09	.11	.13	.14	.16

TABLE II.—(Continued.)

Barometer Twenty-four Inches.				Barometer Twenty-five Inches.			
Inches.	Factor.	Inches.	Factor.	Inches.	Factor.	Inches.	Factor.
24.00	96.91	24.30	91.51	25.00	79.18	25.30	74.00
.01	.73	.31	.33	.01	.01	.31	73.83
.02	.55	.32	.16	.02	78.83	.32	.66
.03	.37	.33	90.98	.03	.66	.33	.48
.04	.19	.34	.80	.04	.49	.34	.31
.05	.00	.35	.62	.05	.31	.35	.14
.06	95.82	.36	.44	.06	.14	.36	72.97
.07	.64	.37	.26	.07	77.97	.37	.80
.08	.46	.38	.09	.08	.79	.38	.63
.09	.28	.39	89.91	.09	.62	.39	.46
24.10	95.10	24.40	89.73	25.10	77.45	25.40	72.29
.11	94.92	.41	.55	.11	.27	.41	.12
.12	.74	.42	.37	.12	.10	.42	71.94
.13	.56	.43	.20	.13	76.93	.43	.77
.14	.38	.44	.02	.14	.75	.44	.60
.15	.20	.45	88.84	.15	.58	.45	.43
.16	.02	.46	.66	.16	.41	.46	.26
.17	93.84	.47	.49	.17	.24	.47	.09
.18	.66	.48	.31	.18	.06	.48	70.92
.19	.48	.49	.13	.19	75.89	.49	.75
24.20	93.30	24.50	87.95	25.20	75.72	25.50	70.58
.21	.13	.51	.78	.21	.55	.51	.41
.22	92.95	.52	.60	.22	.37	.52	.24
.23	.77	.53	.42	.23	.20	.53	.07
.24	.59	.54	.25	.24	.03	.54	69.90
.25	.41	.55	.07	.25	74.86	.55	.73
.26	.23	.56	86.89	.26	.69	.56	.56
.27	.05	.57	.71	.27	.51	.57	.39
.28	91.87	.58	.54	.28	.34	.58	.22
.29	.69	.59	.36	.29	.17	.59	.05

TABLE II.—(Continued.)

Barometer Twenty-four Inches.				Barometer Twenty-five Inches.			
Inches.	Factor.	Inches.	Factor.	Inches.	Factor.	Inches.	Factor.
24.60	86.18	24.80	82.67	25.60	68.88	25.80	65.50
.61	.01	.81	.49	.61	.71	.81	.33
.62	85.83	.82	.32	.62	.54	.82	.16
.63	.66	.83	.14	.63	.37	.83	.00
.64	.48	.84	81.97	.64	.20	.84	64.83
.65	.30	.85	.79	.65	.03	.85	.66
.66	.13	.86	.62	.66	67.86	.86	.49
.67	84.95	.87	.44	.67	.69	.87	.32
.68	.77	.88	.27	.68	.52	.88	.16
.69	.60	.89	.10	.69	.36	.89	63.99
24.70	84.42	24.90	80.92	25.70	67.19	25.90	63.82
.71	.25	.91	.75	.71	.02	.91	.65
.72	.07	.92	.57	.72	66.85	.92	.48
.73	83.90	.93	.40	.73	.68	.93	.32
.74	.72	.94	.22	.74	.51	.94	.15
.75	.54	.95	.05	.75	.34	.95	62.98
.76	.37	.96	79.88	.76	.17	.96	.82
.77	.19	.97	.70	.77	.01	.97	.65
.78	.02	.98	.53	.78	65.84	.98	.48
.79	82.84	.99	.35	.79	.67	.99	.31

Proportional parts for thousandths of inches.

Inches.	.001	.002	.003	.004	.005	.006	.007	.008	.009
Diff	.19	.02	.04	.06	.08	.10	.11	.13	.17
"	.18	.02	.04	.05	.07	.09	.11	.13	.16
"	.17	.02	.03	.05	.07	.09	.10	.12	.15
"	.16	.02	.03	.05	.06	.08	.10	.11	.14

TABLE II.—(Continued.)

Barometer Twenty-six Inches.				Barometer Twenty-seven Inches.			
Inches.	Factor.	Inches.	Factor.	Inches.	Factor.	Inches.	Factor.
26.00	62.15	26.30	57.16	27.00	45.76	27.30	40.96
.01	61.98	.31	.00	.01	.60	.31	.80
.02	.81	.32	56.83	.02	.43	.32	.64
.03	.65	.33	.67	.03	.27	.33	.48
.04	.48	.34	.50	.04	.11	.34	.32
.05	.31	.35	.34	.05	44.95	.35	.16
.06	.15	.36	.17	.06	.79	.36	.00
.07	60.98	.37	.01	.07	.63	.37	39.85
.08	.81	.38	55.85	.08	.47	.38	.59
.09	.65	.39	.68	.09	.31	.39	.53
26.10	60.48	26.40	55.52	27.10	44.15	27.40	39.37
.11	.31	.41	.35	.11	43.99	.41	.21
.12	.15	.42	.19	.12	.83	.42	.05
.13	59.98	.43	.02	.13	.67	.43	38.89
.14	.81	.44	54.86	.14	.51	.44	.74
.15	.65	.45	.69	.15	.35	.45	.58
.16	.48	.46	.53	.16	.19	.46	.42
.17	.32	.47	.37	.17	.03	.47	.26
.18	.15	.48	.20	.18	42.87	.48	.10
.19	58.98	.49	.04	.19	.71	.49	37.95
26.20	58.82	26.50	53.87	27.20	42.55	27.50	37.79
.21	.65	.51	.71	.21	.39	.51	.63
.22	.49	.52	.55	.22	.23	.52	.47
.23	.32	.53	.38	.23	.07	.53	.31
.24	.16	.54	.22	.24	41.91	.54	.16
.25	57.99	.55	.06	.25	.75	.55	.00
.26	.83	.56	52.89	.26	.59	.56	36.84
.27	.66	.57	.73	.27	.43	.57	.68
.28	.49	.58	.66	.28	.28	.58	.63
.29	.33	.59	.40	.29	.12	.59	.37

TABLE II.—(Continued.)

Barometer Twenty-six Inches.				Barometer Twenty-seven Inches.			
Inches.	Factor.	Inches.	Factor.	Inches.	Factor.	Inches.	Factor.
26.60	52.24	26.80	48.99	27.60	36.21	27.80	33.08
.61	.08	.81	.82	.61	.05	.81	32.92
.62	51.91	.82	.66	.62	35.90	.82	.76
.63	.75	.83	.50	.63	.74	.83	.61
.64	.59	.84	.34	.64	.58	.84	.45
.65	.42	.85	.18	.65	.42	.85	.29
.66	.26	.86	.01	.66	.27	.86	.14
.67	.10	.87	47.85	.67	.11	.87	31.98
.68	50.93	.88	.69	.68	34.95	.88	.83
.69	.77	.89	.53	.69	.80	.89	.67
26.70	50.61	26.90	47.37	27.70	34.64	27.90	31.52
.71	.45	.91	.21	.71	.48	.91	.36
.72	.28	.92	.04	.72	.33	.92	.20
.73	.12	.93	46.88	.73	.17	.93	.05
.74	49.96	.94	.72	.74	.01	.94	30.89
.75	.80	.95	.56	.75	33.86	.95	.74
.76	.63	.96	.40	.76	.70	.96	.58
.77	.47	.97	.24	.77	.54	.97	.43
.78	.31	.98	.08	.78	.39	.98	.27
.79	.15	.99	45.92	.79	.23	.99	.12

Proportional parts for thousandths of Inches.

Inches.	.001	.002	.003	.004	.005	.006	.007	.008	.009
Diff. .17	.02	.03	.05	.07	.09	.10	.12	.14	.15
„ .16	.02	.03	.05	.06	.08	.10	.11	.13	.14
„ .15	.01	.03	.04	.06	.08	.09	.11	.12	.14

TABLE II.—Factor of the Barometers.

Barometer Twenty-eight Inches.				Barometer Twenty-nine Inches.				Barometer Thirty Inches.	
Inches.	Factor.	Inches.	Factor.	Inches.	Factor.	Inches.	Factor.	Inches.	Factor.
28.00	29.96	28.30	25.33	29.00	14.72	29.30	10.25	30.00	0.00
.01	.81	.31	.18	.01	.57	.31	.10	.01	.14
.02	.65	.32	.03	.02	.42	.32	9.96	.02	.29
.03	.50	.33	24.87	.03	.27	.33	.81	.03	.44
.04	.34	.34	.72	.04	.12	.34	.66	.04	.58
.05	.19	.35	.57	.05	13.97	.35	.51	.05	.72
.06	.03	.36	.41	.06	.82	.36	.36	.06	.87
.07	28.88	.37	.26	.07	.67	.37	.22	.07	1.01
.08	.72	.38	.11	.08	.53	.38	.07	.08	.16
.09	.57	.39	23.95	.09	.38	.39	8.92	.09	.30
28.10	28.41	28.40	23.80	29.10	13.23	29.40	8.77	30.10	1.45
.11	.26	.41	.65	.11	.08	.41	.62	.11	.59
.12	.10	.42	.50	.12	12.93	.42	.48	.12	.74
.13	27.95	.43	.34	.13	.78	.43	.33	.13	.88
.14	.80	.44	.19	.14	.63	.44	.18	.14	2.02
.15	.64	.45	.04	.15	.48	.45	.03	.15	.17
.16	.49	.46	22.89	.16	.33	.46	7.89	.16	.31
.17	.33	.47	.73	.17	.18	.47	.74	.17	.46
.18	.18	.48	.58	.18	.03	.48	.59	.18	.60
.19	.02	.49	.43	.19	11.89	.49	.45	.19	.74
28.20	26.87	28.50	22.28	29.20	11.74	29.50	7.30	30.20	2.89
.21	.72	.51	.12	.21	.59	.51	.15	.21	3.03
.22	.56	.52	21.97	.22	.44	.52	.00	.22	.17
.23	.41	.53	.82	.23	.29	.53	6.86	.23	.32
.24	.26	.54	.67	.24	.14	.54	.71	.24	.46
.25	.10	.55	.51	.25	10.99	.55	.56	.25	.61
.26	25.95	.56	.36	.26	.85	.56	.42	.26	.75
.27	.79	.57	.21	.27	.70	.57	.27	.27	.89
.28	.64	.58	.06	.28	.55	.58	.12	.28	4.04
.29	.49	.59	20.91	.29	.40	.59	5.97	.29	.18

TABLE II.—(Continued.)

Barometer Twenty-eight Inches.				Barometer Twenty-nine Inches.				Barometer Thirty Inches	
Inches.	Factor.	Inches.	Factor.	Inches.	Factor.	Inches.	Factor.	Inches.	Factor.
28.60	20.75	28.80	17.73	29.60	5.83	29.80	2.90	30.30	4.32
.61	.60	.81	.58	.61	.68	.81	.76	.31	.47
.62	.45	.82	.43	.62	.53	.82	.61	.32	.61
.63	.30	.83	.28	.63	.39	.83	.47	.33	.75
.64	.15	.84	.12	.64	.24	.84	.32	.34	.90
.65	.00	.85	16.97	.65	.10	.85	.18	.35	5.04
.66	19.84	.86	.82	.66	4.95	.86	.03	.36	.18
.67	.69	.87	.67	.67	.80	.87	1.88	.37	.32
.68	.54	.88	.52	.68	.66	.88	.74	.38	.47
.69	.39	.89	.37	.69	.51	.89	.59	.39	.61
28.70	19.24	28.90	16.22	29.70	4.36	29.90	1.45	30.40	5.75
.71	.09	.91	.07	.71	.22	.91	.30	.41	.90
.72	18.94	.92	15.92	.72	.07	.92	.16	.42	6.04
.73	.78	.93	.77	.73	3.93	.93	.01	.43	.18
.74	.63	.94	.62	.74	.78	.94	0.87	.44	.32
.75	.48	.95	.47	.75	.63	.95	.72	.45	.47
.76	.33	.96	.32	.76	.49	.96	.58	.46	.61
.77	.18	.97	.17	.77	.34	.97	.43	.47	.75
.78	.03	.98	.02	.78	.20	.98	.29	.48	.89
.79	17.88	.99	14.87	.79	.05	.99	.14	.49	7.04

Proportional parts for thousandths of inches.

Inches.		.001	.002	.003	.004	.005	.006	.007	.008	.009
Diff.	.16	.02	.03	.05	.06	.08	.10	.11	.13	.14
„	.15	.02	.03	.05	.06	.08	.09	.11	.12	.14
„	.14	.01	.03	.04	.06	.07	.08	.10	.11	.13

TABLE III.—*Factors for the sum of the detached Thermometers.*

Sum.	Factor.		
40	58.74		
50	59.41		
60	60.08		
70	60.75		
80	61.42		
90	62.09		
100	62.76		
110	63.43		
120	64.10		
130	64.77		
140	65.44		
150	66.11		
160	66.78		
170	67.45		
180	68.12		
190	68.79		
200	69.46		

Difference for single Degrees.

1	0.07
2	0.13
3	0.20
4	0.27
5	0.34
6	0.40
7	0.47
8	0.54
9	0.60

*On the Encrustation of Steam Boilers and Pipes in India.—By Dr.
GEO. BUIST, Bombay.*

A very serious source of annoyance to the Steam Engineer in India is the extreme rapidity with which encrustations collect in the recesses of flues, and around the tubes of steam boilers. These often accumulate in parts of the boiler difficult of access, to the thickness of an inch in the course of a year—they intercept heat, diminish the generation of steam, and by permitting the temperature of the iron outside to get high, with a non-conducting substance, rapidly cause oxidation. The crust generally consists of sulphate and carbonate of lime, with a large portion of dried sea salt. The greatest inconvenience is felt with tube boilers. I have known the whole of the tubes burnt out in six months' time, and have seen them, when placed too close to each other, cemented into a solid mass, with the stony matter between. The stony matter consists of sulphate and carbonate of lime, with a very large proportion of sea salt, hardened by the great heat of the flues and tubes when the boiler is emptied too soon after the fires are drawn.

The remedies proposed for this unfortunate state of things are very numerous; none of them have, I believe, proved so successful as might have been desired. I have suggested the expediency of running off the brine leisurely, and filling up the boiler either with sea water not concentrated by boiling, or with fresh water, where this was accessible, so as by these means to get rid of the soluble part of the crust, when the earthy portion, deprived of this, would become so friable and spongy as to drop off.

Dr. Giraud has suggested hanging portions of broken crust in bags inside the boiler, in hopes of affording a nucleus of depository preferable to that provided by the tubes or the boilers themselves.

The Engineers get quit of the crust when it is thin by running off the boilers, and allowing the encrustation to become perfectly dry. When cold, a sudden blaze of chips is lighted in the furnace, by which means the crustings inside crack and drop off. When they grow thick and troublesome, workmen are sent inside the boiler to chop them off.

A curious variety of metallic deposit sometimes occurs on the steam pipe, close to its connection with the cylinder, when the boiler is of iron, the pipe of copper or mixed metal containing copper, a specimen of this accompanies this paper.* It is about half an inch thick, and consists of alternate layers of pure copper, about forty in number, and of copper slightly oxydized. This was found in the steam pipe of the P. and O. S. N. Co.'s Steamer *Pekin*, which connected the fore and after boilers together: the boilers are iron, the connecting pipe copper. There is a considerable scale of rust on the plate through which the pipe passes: there are lead joints between the copper and the iron, to prevent or diminish the action of the metals on each other. The copper crust was found immediately inside the stop valves and extended about a foot into the pipe. The same action is believed to be going on in all the copper pipes, but in this case it was collected by the self-action stop valves: in the other cases the cupreous solution flowed into the boiler or cylinder, and was lost. For the specimen now sent I am indebted to Captain Gribble, and for the information regarding it to Captain Baker, of the *Pekin*.

It is quite clear here that a complex series of chemical processes must have been going on to produce this beautiful specimen of Electro-type copper, which was soft, and cut like black lead when first received, though it has now assumed its proper hardness. We must first have had the copper dissolved by the steam or water in the pipe, the solution collected beyond the stop valve must have been revived by galvanic action induced by the copper and iron on each other. It is probable that each layer was due to a single working of the boilers, and that the open film between was produced when the steam was down. No similar deposit has ever been met with by any of the Engineers I have seen.

* Deposited in the Museum of the Asiatic Society.—Eds.

PROCEEDINGS
OF THE
ASIATIC SOCIETY OF BENGAL
FOR JUNE, 1850.

At a Meeting of the Asiatic Society of Bengal held on the 5th June, 1850,

The Hon'ble Sir J. W. COLVILLE, President, in the Chair,

The proceedings of the May Meeting were read and confirmed.

Letters were read—

From G. A. Bushby, Esq. and Lieut. A. G. Austen, intimating their desire to withdraw from the Society.

From J. Thornton, Esq., Secretary to the Government of the North Western Provinces, enclosing, in original, the first 70 paragraphs of a Report on the Statistics of the Banda district, drawn up by Mr. M. P. Edgeworth, Esq. C. S. Ordered for publication in the Journal.

From Munshi Nizam-Ud-din of Poonah, offering his services to the Society as a translator, and forwarding a copy of a Hindustání work by him, entitled Insha-i-Hindi.

From Captain J. C. Hannington, submitting a set of Tables for computing heights by the Barometer.

From Rev. J. Long, soliciting copies of the Bibliotheca Indica for ten Vernacular Libraries established by the Church Missionary Society, in Calcutta, Krishnaghur and Bardwan.

Ordered that the subject be brought forward for consideration at the next meeting, and that in the meantime, Rev. Mr. Long be requested to send in an official letter regarding it.

From Captain Thuillier, offering copy of a Map of Sikkim and Eastern Nepaul, by Dr. J. D. Hooker, for publication in the Society's Journal.

Ordered that the Secretary and the Finance Committee consider and report as to the expense of publishing it in the Journal.

From W. Seton Karr, Esq., Under Secretary to the Government of Bengal, regarding an application of the Statistical Section of the Society, for permission to have access to the Index to the records of the Bengal Secretary's Office.

*From the Under Secretary to the Government of Bengal,
To the Vice President and Secretary to the Asiatic Society.*

Dated Fort William, the 8th May, 1850.

SIR,—I am directed by the Deputy Governor of Bengal to acknowledge the receipt of your letter, dated the 27th March last, submitting a solicitation, on the part of the Statistical Section of the Asiatic Society, for permission to have access to the records of the Bengal Secretary's Office, with a view to the publication of its Indices.

2. His honor regrets that he is unable to comply with the above request.

I have the honor to be, Sir,

Your most Obedient Servant,

W. SETON KARR.

Under Secy. to the Govt. of Bengal.

From P. B. Reid, Esq. Secretary to the Agra Local Agency, enclosing a memorandum of five gold coins, lately dug out of a ruin in the vicinity of the Agra Fort, and enquiring whether the Society would like to purchase them.

Resolved, that the Society does not consider it desirable to purchase the coins.

From Captain H. L. Thuillier, Deputy Surveyor General, forwarding Tables of the monthly means of Maximum and Minimum Pressures from 1840 to 1849, taken from the Meteorological Register kept at the Surveyor General's Office, Calcutta.

From Maulvi Golam Akbar, late Persian Librarian, praying for a testimonial for his past services to the Society.

Resolved, that the Secretary be desired to grant the request of the Maulvi.

From Dr. E. Roer, Secretary to the Oriental Section, recommending on the part of the Section, the publication of a translation of the Ch'handogya Upanishad by Bábu Rájendralal Mittra.

Ordered for publication in the Bibliotheca Indica.

From the same, the subjoined letter, in reply to a reference from the Society, regarding the Section's report of the 1st. April last.

To Captain F. HAYES, Secretary, Asiatic Society.

SIR,—By direction of the Oriental Section, I have the honour to return, for the orders of the Council and the Society, my Report of the 1st April last on Oriental Publications, referred for the reconsideration of the Section, and to state, that the Section would recommend, that the publication of texts should proceed, and the translations follow as soon as practicable.

2. I beg to observe, that in proposing so many texts for publication it was not intended, that all of them should be printed with the exclusion of other important works, which might hereafter be proposed by other scholars, but, that sufficient time should be given to obtain good MSS. to examine and to compare them. Without this we would not be able to publish editions worthy of the high standing of our Society. The necessity of an early selection will be evident from the fact, that the Library of the Asiatic Society hardly contains one MS. fit for printing, and that, had I not been assisted by MSS. procured either from public collections, or private individuals, I would not have succeeded in publishing even one of the works already printed. I may perhaps not be able to collect a third of the works proposed, and on their collection the MSS. may prove so bad as to preclude the hope of their early publication. Of the works enumerated in the list, only two are prepared for printing, viz. the Uttara Naishadha, of which I have procured a sufficient number of MSS., and the Bháshá Parich'héda of which the translation is ready.

3. I have the honour to lay before the Society abstracts of interesting letters, received from Messrs. Lassen, Burnouf and Müeller, on our publications, and I hope, that the discussion, which at the April meeting took place on the mode of my publishing, may serve as an apology for not having omitted the flattering expressions about myself.

I have the honour to be, Sir,

• Your most obedient servant,

E. ROER.

Secy. Asiatic Society, Oriental Department.

Howrah, the 1st June, 1850.

To Dr. W. B. O'SHAUGHNESSY, Senior Secretary of the Asiatic Society.

SIR,—The publication of the Upanishads, which are accompanied with a commentary of S'ankara Achárya, being nearly completed, I have the honour, by direction of the Oriental Section, to propose, for the consideration and orders of the Council and Society, the gradual publication of the following works in the Bibliotheca Indica :

1. The Uttara Naishadha, or the second part of the Naishadha, together with the commentary of Náráyan Pandit.
2. Tha Vaishéika Sútras with the commentary of Sri Sankara.
3. The Bháshá Parich'héda with an English translation.
4. A selection from the best Dramas in Sanskrit, not yet published.
5. The Puránas.
6. The most important Astronomical works of the Hindus, and at first Varáhamihira's Váráhi Sanhitá and Pancha Siddhantas, if these works can be obtained.
7. Nala Champu.
8. Bhoja Champu.
9. Bharata Champu.
10. Rághava Pándavíya.
11. Anargha Rághava.

By the completion of the Naishadha the Society, who published the first part in 1836, would gratify the wishes of the Oriental scholars in Europe as well as in India. As Prem Chander Pandit of the Sanskrit College in Calcutta, who has written the commentary to the first part of this work, is not prepared to furnish us with a commentary to the second, the Section proposes, that the Tiká of Náráyan Pandit, one of the oldest and best commentaries, be added to the text.

The Sútras of Kanáda deserve also the early patronage of the Society, as no work of the Vaishéika school of philosophy has yet been printed.

The Society, some years ago, sanctioned the publication of the text of the Bháshá Parich'héda together with an English translation which I had prepared. This translation, as the Society will recollect, was lost by the transfer of papers from the former Secretary's office. I have since revised a rough copy, and have now the pleasure to offer it to the Society for publication, together with the preface and text, in the Bibliotheca Indica.

2. It is further proposed: 1.—That every three months copies of the Bibliotheca should be sent to those Societies and scholars to whom they were presented before. 2.—That 25 copies should be, regularly every month, transmitted to Messrs. Allen and Co., complaints having reached us, that no copies are for sale in Europe. 3.—That a certain number of copies should

be forwarded to the School-Book-Societies in Allahabad and Agra, and to booksellers in Bombay and Madras, for sale on account of the Society.

3. The Section beg to recommend the purchase of the accompanying MS., containing a Persian translation of the Upanishads, which has been offered to the Society at the price of 12 Rupees.

I have the honour to be, Sir,

Your most obedient servant,

E. ROER,

Secretary, Oriental Section, Asiatic Society.

Howrah, the 1st April, 1850.

Resolved, that the Society adopt the proposition of the Oriental Section regarding the publication of the Uttara Naishadha and Bháshá Parich'héda, and for the transmission of the copies proposed to be sent to Messrs. Allen and Co., and to the bodies and persons to whom copies of the Bibliotheca Indica have hitherto been sent, and refers it to the Oriental Section to consider and report, whether the list of bodies and persons to whom that publication is now sent, may, to any, or what extent, be usefully enlarged.

From John Barlow, Esq., Secretary to the Royal Institution of Great Britain, acknowledging receipt of No. 206 of the Journal, presented to that Institution by the Society.

From D. Edward Ruppell, Esq., Frankfort, offering a set of his Zoological works in exchange for a set of the Transactions of the Society.

Ordered that the Secretary communicate to Mr. Ruppell, that a set of the Asiatic Researches from VI. @ XX. (the first five volumes being out of print) will be forwarded to Messrs. Allen and Co. to whom he may send his works for the Society.

From George Balfour, Esq., Magistrate of Monghyr, regarding the gold coins submitted to the Society for inspection, by Mr. Cunliffe.

The coins were ordered to be returned to Mr. Balfour.

From Dr. E. Roer, Secretary, Oriental Section, recommending that an English translation of the Lalita Vistara submitted to the Section by Bábu Rajendralál Mittra, be published in the Bibliotheca Indica.

Resolved unanimously, that the recommendation of the Oriental Section be adopted.

From the same, proposing that the Rev. Principal Kay of Bishop's College, be elected a member of the Oriental Section.

On the question being put to the vote Rev. W. Kay was unanimously elected.

From Col. J. Low, Penang, announcing despatch of a collection of MSS. and Antiquities per "Erin," for the Society.

The Zoological Curator and Librarian having submitted their reports the Society adjourned.

Read and confirmed, 3rd July, 1850.

J. W. COLVILE, *President*.

FLETCHER HAYES, *Secretary*.

Report of Curator, Zoological Department, for June Meeting, 1850.

SIR,—I have to announce the presentations of a rare Australian Parrakeet (*Psephotus hamatonotus*, Gould), by Capt. Lewis of the Barque 'Tenas-serim,' and of the carcass of a Bara Singha doe (*Cervus Duvaucelie*, Cuv.), by Bábu Rájendra Mallika.

And I have personally the pleasure of presenting the Society with skeletons of the Peruvian Llama, Snowy Owl, Crowned Crane, and Hooper Swan. Also with a collection of some of the more shewy Brazilian *Papere's* (chiefly *Pipræ*, *Tanagræ*. and *Trochilidæ*), adding 38 species to our bird collection; and with an extensive series of land, fresh-water and marine Australian shells.

Lastly, I may mention that I have succeeded in procuring for the Museum, skeletons of both sexes of a species of Ca'ing Whale (*Globicephalus*,) in form and size resembling the European *Gl. deductor*, but wholly of a deep black colour. A shoal of these animals numbering about 20, was carried by an extraordinary high tide, into the salt-water lakes eastward of Calcutta, where several of them lived many days, floundering about in the shallow-water; and in this situation I had repeated opportunities of witnessing the expiration from the spiracle within the distance of a few feet, no jet of water of course being thrown up, but a very visible discharge of aqueous particles, as from a wet syringe, and this while the spiracle remained above water.

I have the honour to be, Sir,

Your's obediently,

E. BLYTH.

Asiatic Society's Rooms, June 1st, 1850.

LIBRARY.*

The following books have been added to the library since the last meeting.

Presented.

On the Vegetation of the Galapagos Archipelago as compared with that

of some other Tropical Islands and of the Continent of America. By Dr. J. D. Hooker. (Pamphlet.)—PRESENTED BY THE AUTHOR.

Journal of the Academy of Natural Sciences of Philadelphia, Vol. I. Part IV.—PRESENTED BY THE ACADEMY.

Systematisches Verzeichniss der naturhistorischen Sammlung der Gesellschaft Museum. Erste abtheilung. Voegel. Bremen, 1844, 4to.—By Dr. G. HARTLAUB.

Systematischer Index zu Don Felix de Azara's Apuntamientos para la historia natural d los paxaros del Paraguay y Rio de la Plata. Von Dr. G. Hartlaub. Bremen, 1847, demi 4to.—By THE AUTHOR.

Erstes Nachtrag zum Verzeichniss der Vogelsammlung des Museums. (Pamphlet.)—By Dr. G. HARTLAUB.

Wanderings in the Islands of Interview (Andaman) Little and Great Coco. By J. H. Quigley, Esq. Maulmain, 1850, 12mo. Pamphlet.—By THE AUTHOR.

Fontana on Poisons, 2 vols. 8vo.—By Dr. W. B. O'SHAUGHNESSY.

Mead on Poisons, 1 vol. 8vo.—By THE SAME.

Catalogue des Coins et Medaelles du Musee Monitaire de la Commission des Monnaie et Medailles, Paris, 1833, 8vo.—By THE SAME.

Journal of the Agri-Horticultural Society of India, Nos. X.-XI. of Vol. II. and Part II. Vol. VI.—By THE SAME.

Calcutta Journal of Natural History, Nos. 1, 3, (two copies) 10, 11, 12, 14, and 17.—By THE SAME.

Griffin's Scientific Miscellany, No. VI. The Geology of the Island of Arran, from Original Survey. By A. C. Ramsey, (2 copies).—By THE SAME.

Insha i Hindi, being a collection of some hundreds of letters and petitions, &c. with an entire translation of the Inshá i Harkaran. By Munshi Nizám Uddin. Bombay, 1850, 8vo.—By THE AUTHOR.

Meteorological Register kept at the Surveyor General's Office, Calcutta, for the month of April, 1850.—By THE DEPUTY SURVEYOR GENERAL.

The Oriental Baptist, Nos. 41-2.—By THE EDITOR.

The Upadeshaka, Nos. 41-2.—By THE EDITOR.

The Oriental Christian Spectator for April, 1850.—By THE EDITOR.

Calcutta Christian Observer for May and June, 1850.—By THE EDITOR.

Exchanged.

The Athenæum, Nos. 1165-7-9-70-71-72.

Purchased.

The Kádamvari, edited by Pandit Madanmohan Tarkalankár, Vol. II. Calcutta, 1850, 8vo. 5 copies.

The Annals and Magazine of Natural History, No. 27.

Meteorological Register kept at the Surveyor General's Office, Calcutta, for the Month of May, 1850.

Date.	Observations made at sun-rise.					Maximum Pressure observed at 9h. 50m.					Observations made at apparent noon.				
	Temperature.					Wind.					Temperature.				
	Bar. 32° red. to	Of Mer.	Of Air.	W. Bulb.	Aspect of Sky.	Bar. 32° red. to	Of Mer.	Of Air.	W. Bulb.	Aspect of Sky.	Bar. 32° red. to	Of Mer.	Of Air.	W. Bulb.	Aspect of Sky.
1	Inches 29.717	79.4	80.2	78.2	Cloudy	Inches 29.770	90.0	89.5	82.0	S. W. Clear	Inches 29.743	93.0	92.3	82.4	S. W. Clear
2	767	80.0	80.3	77.2	Clear	813	89.9	89.3	80.8	S. W. sp. Ditto	775	94.0	93.6	81.2	S. Ditto
3	781	79.8	80.0	77.6	Clear	888	88.1	88.7	79.3	S. sharp, Cumuli	825	92.0	91.9	79.2	S. sharp, Ditto
4	787	79.4	80.0	77.8	Cumuli	798	88.7	88.0	80.3	S. sharp, Ditto	737	91.4	91.0	81.4	S. W. sp. Cumuli
5	781	81.3	82.0	76.8	Cloudy	716	90.0	89.3	80.3	S. W. Clear	673	92.8	92.3	81.7	S. W. Clear
6	681	80.0	80.3	76.8	Clear	693	88.5	88.0	80.3	S. W. sp. Cumuli	655	91.7	91.3	83.0	S. sharp, Ditto
7	640	80.4	81.2	79.5	Scattered clouds	635	90.4	90.2	81.3	S. W. sp. Cumuli	602	96.7	96.0	79.8	S. W. Cirro-strati
8	592	80.4	81.8	79.5	Scattered clouds	700	91.8	91.0	83.2	S. W. Clear	689	97.2	96.6	84.2	S. S. W. Clear
9	640	81.2	82.0	79.5	Cumuli.	722	91.3	90.7	82.8	S. W. Cumuli	689	95.4	95.0	85.2	S. Ditto
10	679	81.9	82.0	79.0	Cumuli.	730	91.2	90.0	81.4	S. W. Cumuli	716	94.2	93.7	82.8	S. W. Cumulo-strati
11	705	77.0	77.5	74.8	Cirro-strati	773	90.7	89.7	80.8	S. W. Ditto	748	94.5	93.8	81.8	S. S. W. Cumulo-strati
12	754	79.4	79.6	73.0	Cumuli	784	91.4	90.5	80.8	S. Cumuli	748	94.4	93.8	81.8	S. S. W. Clear
13	717	81.5	82.2	73.8	Ditto	761	93.0	91.8	81.5	S. Ditto	720	96.2	95.5	81.3	S. Ditto
14	675	81.5	82.0	73.6	Clear	717	93.2	92.2	82.4	S. Clear	689	98.0	97.4	83.0	S. Ditto
15	682	81.2	81.8	73.2	Cloudy	701	93.3	92.5	83.0	S. Ditto	683	97.0	96.2	83.7	S. W. Ditto
16	635	81.5	82.0	80.0	Clear.	679	93.3	92.5	83.0	S. W. Cirro-strati	668	95.8	95.2	84.0	S. sharp, Ditto
17	673	82.1	82.6	80.2	Clear.	735	93.0	93.8	81.5	S. W. Cirro-cumuli	727	97.3	96.2	80.8	S. W. Ditto
18	762	81.9	82.2	80.0	Ditto	811	94.3	93.3	83.5	S. S. W. Ditto	805	95.8	95.8	81.3	S. W. Cloudy
19	827	81.2	81.8	79.3	Ditto	866	93.3	92.7	81.5	S. W. Ditto	840	97.0	96.2	83.0	S. Cumuli
20	834	81.8	82.0	79.4	Clear	854	90.8	91.0	80.6	S. W. Cumulo-strati	803	95.2	94.7	82.5	S. W. Ditto
21	734	81.0	81.7	79.4	Ditto	796	93.7	93.0	81.2	S. Cumuli	750	95.4	95.2	80.3	S. W. sp. Clear
22	732	81.6	82.2	78.2	Cumuli.	819	91.7	91.2	81.0	S. Ditto	782	95.6	94.8	80.9	S. sharp, Cumuli
23	779	81.8	82.6	76.3	Cloudy	863	89.0	88.9	79.8	S. Cloudy	806	91.4	91.7	80.3	S. W. sp. Cirro-strati
24	762	82.1	82.6	78.4	Cumuli	717	92.1	91.9	82.2	S. Cloudy	691	94.7	94.7	80.3	S. W. sp. Cirro-strati
25	697	83.8	84.4	79.8	Ditto	722	90.3	90.2	82.0	S. W. Cumuli	698	97.3	96.0	83.5	S. Cumuli
26	682	76.2	76.2	74.2	N. W. Cirro-strati	717	92.0	91.0	82.8	S. W. Cumulo-strati	709	93.0	92.7	78.8	N. E. Cirro-strati
27	687	81.9	82.4	80.3	Ditto	739	89.2	88.0	75.3	N. E. Clear	692	96.5	96.3	82.0	S. Cumulo-strati
28	721	75.3	75.7	72.3	N. W. W. Ditto	674	92.4	92.2	82.1	S. W. Cumulo-strati	667	88.4	87.0	80.0	N. E. Cloudy
29	641	82.8	83.1	80.9	Scattered-clouds	676	84.8	84.2	80.2	E. N. E. Cloudy	659	93.8	92.4	82.0	N. E. Cumulo-strati
30	642	78.4	79.2	77.2	Cloudy	674	96.4	97.8	81.3	E. Cumuli	659	93.8	92.4	82.0	N. E. Cumulo-strati
31	648	78.0	78.3	77.0	Cirro-strati	674	96.4	97.8	81.3	E. Cumuli	659	93.8	92.4	82.0	N. E. Cumulo-strati
Mean	29.706	80.5	81.0	76.3	.....	29.749	91.2	90.4	81.2	.....	99.722	94.7	94.2	81.9	.....

Meteorological Register, continued.

Observations made at 2h, 40m.

Minimum pressure observed at 4 p. m.

Observations made at sun-set.

Maximum	Rain Gauges.
16.0	

[illegible]

JOURNAL

OF THE

ASIATIC SOCIETY.

No. VI.—1850.

Report on the Valley of Spiti; and facts collected with a view to a future Revenue Settlement.—By Captain W. C. HAY, B. A., Assistant Commissioner, Kulu.

Approaches to the country.—I gather from information that the valley of Spiti is approachable from our own territories and Kunnáwar, by six different routes.

First Pass.—First, and easiest, is through Kunnáwar, viâ Shiálkar, over a low range of hills by the Klágar pass to “Súmrah,” the last village in the Busahir territory, and thence across the Spiti river to “Lári,” the first village in Spiti. By this route you meet with three mountain passes; viz. the “Warang,” between “Chuni” and “Lupá” in Kunnáwar, which is 13,000 feet high; the “Runang,” 14,508 feet, between Kannar and Súngnam in Kunnáwar; and the “Húngrung,” 14,837 feet, between “Súngnam” and “Hungo,”—and have to cross the Spiti river which is not bridged; rapid, and $3\frac{1}{2}$ feet of water.

Second pass Mánrang.—The second is over the “Mánf” pass, commonly called the “Mánrang;” but “rang” merely signifies a pass. The road to this is from “Súngnam” in Kunnáwar, to “Robak” where copper mines are worked by the Busáhir Rájá; then over the pass, which Captain Gerard, I think, calls 18,000 feet to “Mánf,” a village in Spiti, and one march from Dankar: this pass

is not open until May, and closes usually in October. The "Máni" pass bears from Dankar East 46; there are two very high peaks above the pass, and a lake called "Máni-ke-Choh."

Third Pass "Bhubáh."—The third pass is the "Bhubáh Jhote." The road to this jhote strikes off from the Sutlej at the Waugtú-bridge, ascending to the village of "Gutgáon" in the Pargannáh of Bhubáh in Busáhir; thence the pass is two marches from any habitation: it is a high pass, probably near 18,000 feet; you cross it and descend to the village of "Múdh" in Spiti, only one march. This is by far the shortest road to Rámpúr; but the pass is only open from May until October. I contemplated coming to Spiti by this route, but snow fell for four days successively, and I gave up the intention. Two Spiti men afterwards tried it, and had to march unceasingly for two days in 3 feet of snow, and one man was frost-bitten; it is certainly impracticable for Hindustanis in November.

Fourth Pass "Satoláh."—The fourth pass is the "Satoláh," which leads into Kúlú, entering it at "Jagat Súkh;" by this pass you have to pass the Shigri; the marches are as follow:

From Dankar to Kurjeh,	1
Pámo,	} 2 in Spiti.
Lohsar,	
	3
Kúnzam ghat, on this side	4.
Shigri Ghátí,	5.
Sutlehheth,	6.
Gúnzú Pattar,	7.
Jagat Sukh,	8.

In this route, it is said, there are three streams to pass, which are impracticable for Ghoonts, and only open from May until October.

Fifth Pass "Kanzum."—The fifth pass is "Kanzum Lámú." "Lámú" signifies pass: this leads into Kulu, viâ the Rotang pass, and is only open from May until October.

Sixth Pass "Bará Lachá."—The sixth pass is the Bará Lachá, viâ Láhoul and the Rotang pass. The marches to Lohsar are as at the fourth pass, thence to Takpokongyah to Bara Lachá, &c. :—Only open from May to October.

These are the passes from our own Territories and Busáhir, through the outer chain of mountains.

Passes into Tartary.—Through the second chain of mountains into Ladak and Tartary, there are three passes.

1st to Chúmúrti.—The first from Lári to Chúmúrti in Tartary; the marches are as follow, being six days' journey.

All these places are beyond our frontier.	{	1st, Húling.
		2nd, Súng-kill.
		3rd, Tún-tún.
		4th, Pút-pút (lámú) said to be a very high pass.
		5th, Rúm-búding.
		6th, Chúmúrti.

2nd Pass into Tartary—"Párang."—The second pass is over the "Párang" lámú, upwards of 16,000 feet, and goes by the villages of "Ki Gúmpá" and Kibar to Rúksú, a district in Ladak. This is usually called the "Párang Lá," Lá being the contraction of "lámú" a pass.

3rd Pass into Tartary—"Tungling."—The third pass is over the "Tungling" lámú, a very high pass, also leading to Rúksú, and the road strikes off between the villages of "Hall" and "Qatu," but on the opposite side of the Spiti river.

These are all the passes through the mountains into Spiti that I have as yet become acquainted with.

Boundaries.—The boundaries of Spiti are as follow. It is bounded on the North by the Párang range, which separates it from Ladak. To the North East there is no defined boundary, but inaccessible mountains.

To the South and South East by the Máni pass ranges which separate it from Kunnáwar.

To the East a valley, called "Kurati" takpo, separates it from Chinese Tartary.

To the West, the snowy range from "Bhubáh" to "Bará Lachá," Bhubáh Jhote, separating it from Busáhir, and the latter from Kulu, and Lahoul. The Bhubáh Jhote is to the W. S. W. and the Bará Lachá N. W. These appear to be all natural boundaries.

Valleys.—The length of the Spiti Valley, longitudinally, I should estimate at about sixty-six miles; the following being my supposed distances between each place situated in the valley. From the boundary

before reaching Lári,	..	..	..	6 miles.
From Lári to Po,	..	..	..	8
Dankar,	..	..	..	10
Lidang,	..	..	..	6½
Kíü Sing,	..	..	..	4½
Rangrik,	..	..	..	5
Ull,	..	..	..	10
Hansi,	..	..	..	10½
Lohsar,	..	..	..	5½
Total,..				66 miles.

There are three transversal valleys, one in the direction of the curved line of mountains extending from the Bará Láchá to the Bhubáh pass. The length of this valley to which villages extend may, from the Spiti river to the village of "Múdh," be estimated at 30 miles.

The second transversal valley extends from the Spiti valley, in the direction of another curve of high mountains, separating the Spiti valley from Tartary, and whence arise another line of water heads; the rivers running in an opposite direction. The inhabited part of this valley does not extend above ten miles. From this again, is a lateral valley, running almost parallel with the Spiti, in which are only two villages in about three miles.

A third transversal valley is the "Párang," leading up to the "Párang pass" into Ruksu, or Ladak; in this there are only two villages in about two and a half miles. These may be said to contain the inhabited and cultivated parts of Spiti.

The passes through these valleys I have already mentioned.

Crops.—The crops in Spiti consist of two kinds of barley, one of wheat, peas, and mustard from which oil is made. They sow in May, and reap in September.

Rivers.—The principal river is the Spiti; I followed it up as far as "Lohsar," where it divides into two branches, one called "Pílu" running from the North West, and another flowing from the "Kúnzam lámú," and called "Líchú" from the South West, and said to be four days' journey.

The peculiarity of this river is the immense width of its bed, being (from the time it takes a South and South East direction, where the

"Párang" river enters it, to a point where another stream flows into it from the "Máni rang") seldom less than half a mile wide, and, in some parts, nearer a mile.

At this season of the year, the main stream is not in most places above forty yards wide, or above three feet deep,—that is above Dankar. This river is also remarkable for its very flat bed, and for not containing boulders of any large size—none above a foot in measurement, but much more generally small stones, gravel, sand, and a calcareous marl.

Its principal tributaries are the "Tungling," "Párang" and "Lingti" flowing into it from the left bank; and the river "Peen" on the right.

The "Tungling" and "Párang" flow from mountains of the same names, each source distant about 20 miles.

The river "Lingti" flows from Lúngpá: it is said to be two days' journey, and above the village of "Lílong" it is called the "Pedangehi;" its bed is about eighty yards, and the stream at present is about 20 feet wide.

The river "Peen" is said to flow from the "Bhubáh" Jhote and above takes the name of the "Bhubáh." When the river takes a S. W. direction it is joined by another considerable stream, the "Yensá," flowing from a mountain of that name two days' journey from its junction with the "Bhubáh." Another large stream then joins the "Bhubáh" called "Para Kiö," which is said to flow from a mountain of that name four days' journey; its course appears to be nearly South. The "Bhubáh" then takes the name of "Peen" from the Koti of "Pínú," or valley, through which it flows. The width of this river bed is from 300 to 800 yards.

There are many other feeders to the Spiti, but which may be more appropriately termed torrents, principally running into the Spiti, on its right bank, with a course from the mountain, through which they have forced their way, of about half a mile; some of their beds are very remarkable, from 300 to 500 yards wide, quite straight and parallel, like the banks of a canal, and the débris, in some instances, from 200 to 300 feet above the water level: the rush of water on the melting of the snow, must be very great through these channels. The Spiti river is, at this season of the year, in some parts completely frozen over, and you can both hear and see the stream flowing beneath

the ice. A great quantity of border ice is frequently broken up and carried down the stream, which occasionally gets jammed, and the passage is interrupted; the river above then increases in depth, and becomes impassable.

The bed of the Spiti is so deep as to prevent its water being of any assistance to the people in cultivating; they depend entirely upon the small streams from the mountains feeding their kools. On the right bank of the Spiti are immense beds of débris, forming plateaux of sometimes two miles in length, and from half to one mile in breadth; a quantity of calcareous deposit has taken place upon the débris, and would afford excellent arable ground, but for its aridity, and impossibility of conducting courses to water it: in some seasons when a great abundance of snow has fallen upon the range of mountains immediately above the level ground, cultivation is attempted, but it is very uncertain, and in taking revenue from the country, it cannot be accounted as productive soil.

The probable total length of the Spiti river, from its source to its junction with the Sutlej, may be estimated at one hundred and twenty miles. I am told that fish have never been seen in the Spiti river.

GEOLOGICAL FORMATION.

Physical and General view.—The Physical and Geological account of this country, such as I am able to give, can be embraced in a small compass. The account of the mountains, valleys, and passes will, in fact, explain the physical position.

Gypsum and Alum.—The formations that I have seen, belong wholly to the secondary period: in fact, Spiti may be described generally as being of various kinds of lime and sandstone, with a few slates and shales, and conglomerates. On descending to the bed of the Spiti, after crossing the range which separates it from Kunnâwar, beds of red sandstone are first met with; in connection with these, below Lâre is gypsum, and alum; and, from the water all the way from Lâre to Dankar being saline, I have no doubt but that rock salt may be discovered in the vicinity of the gypsum.

Fossil beds.—These secondary strata contain some excessively interesting fossil beds. The first which I examined are in the Pínú valley, and above the village of "Mekiön;" they are a marine deposit, and

belong to the "Porkilitic" group, being situated between the beds of "lower new red sandstone" and the Magnesian group or dolomitic conglomerate; these again being associated with beds of shale, and mountain lime-stone, point it out as an exceedingly likely locality for coal; the snow however was on the ground and the Thermometer not above 10° in the middle of the day, when I visited the place, so that my observations were unsatisfactory.

The fossil beds of Ammonites are of great extent, varying from the size of a cart wheel, to an inch in diameter: in a very short time I collected as many as two men could carry, and could distinguish as many as six or seven different species of Ammonite, with a variety of other shells, and one or two vertebræ of fish.

Oxide of Iron.—A large quantity of red oxide of iron is found somewhere in the vicinity, which is used by the people for ornamenting their houses, marking their sheep, &c.; this locality, when free from snow, would be worth observing, because beds of this description often overlay silver and lead ores.

Lias and lower Oolitic beds.—The other fossil beds, which I examined, are in one of the lateral valleys near the village of "Gienmul." The formation corresponds with our well known "Lias," and "lower oolitic" reposing on the Lias. The mountain, behind which these beds are situated, is composed of a series of calcareous and sandstone beds, in an almost undisturbed position.

The decomposing Lias, with much indurated mud or clay, and greatly tinged with iron, have greatly the appearance of a coal field, and are on undulating hills; these are filled with ammonites of only one species: the decomposition of this group furnishes the richest ground in Spiti; the soil at "Lidang" and "Lará" seems also to be of this description, but the fossils are not so abundant. The lower oolitic reposes on the Lias, and is composed of rather complicated strata, containing immense quantities of dead shells in a black deposit of extreme fineness; this clay is perhaps an indication of the neighbourhood of coal. I procured a quantity of these fossils, consisting of a variety of bivalve shells, one or two univalves, and varieties of Belemnites and "Orthoceras."

The mountain lime-stone is the most abundant formation in Spiti, and abounds with species of ammonite, Orthoceras, Spirifer, Ters-

bratulæ, &c. &c. ; some of these beds may perhaps be attributed to the primary fossiliferous or "Silurian" group, since they are in a horizontal position, and have never been disturbed since their deposition, and they are a dark gray argillaceous deposit, below which a slaty sandstone is met with ; the fossils generally being, "pentamerus," "tentaculites" ammonites and belemnites—all indicative of the Silurian group.

Soil.—This brief description will so far tend to show that the productive soil of Spiti, is in general calcareous. As far as Lidang it is of a light colour ; from Lidang to Kí, the soil is blackened by the fossils ; and above these places, to the head of the valley, the soil assumes a reddish appearance, from the calcareous soil being more or less mixed with the decomposing siliceous particles of red sandstone.

These soils are all light, and easily turned up by the plough, and should, if properly watered, be highly productive.

Secondary Strata.—It is a fact to be noted, that Herbert in his mineralogical survey of the Hímalaya, travelled as far as the Hungrung pass in Kunnáwar, and leaves it with a remark, that lime-stone is never, in these mountains, a principal formation : now, the principal lime-stone formation is only there beginning, the whole of Spiti may be said to be a lime-stone formation ; likewise, a great part of Lahoul. Herbert also says, after mentioning the formation of gneiss. &c., that "outside of the whole are very limited examples, of the secondary strata." Now the secondary strata are of great extent, but not as observed by him. The secondary strata begin at the Hungrung pass, which is a mere spur from higher mountains, chiefly composed of lime-stone and sandstone, as the boulders in the river at Súngnam might have pointed out, but he merely sighted the lime-stone, and drew, in my opinion, an incorrect conclusion.

The Bará Lachá, and many other mountains from 16,000 to 20,000 feet high, are secondary, although certainly very uncommon height for secondary formations : and it will be a natural conclusion that nearly the whole range, bounding the Tartar plains in this direction, are secondary or certainly not older, which would give as great a breadth of secondary as primary formation.

Population.—The five Kotis into which Spiti is divided contain upwards of sixty villages, enumerated in Table No. 1. The whole of

these villages contain only three hundred and sixteen houses, and their population is as follows, the census being from actual enumeration.

Adult males,	-	-	-	-	392
Boys under 12 years,	-	-	-	-	191
Adult females,	-	-	-	-	593
Girls under 12 years,	-	-	-	-	238
Lambas or priests not included above,	-	-	-	-	193

Total, - 1,607

giving a total of one thousand six hundred and seven souls.

The population is represented to me as having been on the increase for the last five years.

Revenue.—It is not without some difficulty that I got the people to make me acquainted with the revenues which had been formerly paid, but I believe the following to be pretty correct.

Revenue for 1847-48-49.—The revenue for the years 1847-48-49 has been paid to the Vazir of the Rájá of Busáhir—at least for 1847 and 1848; that for 1849 was tendered to the Vazir, who has since written to me to receive it on account of Government. The revenue paid to Mansúk Dús, the Vazir of the Busáhir Rájá, in 1847, was merely 753 rupees.

In 1848, the same sum was paid, with the addition of 400 lacs* of grain, the produce of some land at Dankar, which was called Sircári.

The revenue for 1849 is still in hand, and is 753 rupees and 500 lacs of grain, now in the fort of Dankar, which will be made over to the Vazir of the Rájá, and 753 rupees, credited to Government.

Mansúka Das, Vazir, made an offer to Mr. Edwards, the Superintendent of hill states, to continue farming Spiti, upon an increased rent of 1,000 rupees, and I believe he recommended to the Board that his offer should be accepted; but I think it very objectionable, for the Spiti people believe that he only took the sum fixed for the three years, with a view of obtaining a longer lease, when they were apprehensive that it was his intention to exact more from them.

The Spiti Vazir holds a paper, written in Thibetan, signed by the late Mr. Agnew, which the people here say is guaranteeing to them that no more than 753 rupees should be levied from them. I have no means

* See page 440.

of testing the truth of their assertion, nor do I know whether Mr. Agnew was authorized to make such an agreement, but I have treated the subject lightly, nor could they have considered it very binding, from the fact of their having paid to Mansúka Dás, in excess of the 753 rupees, grain to the value of 200 rupees or upwards.

Revenue for 1844-45-46.—In the years 1844-45 and 46, the annual revenue paid to the Thánádúr at Ladak was 1,031 rupees. Besides this, 100 “Múndís” or iron crow-bars; likewise two Ghoonts, and a nazaráná of 15 rupees annually to the Thánádár, and 60 sheep in jugat.

During these three years the Seiks are said to have further plundered the country of 4,000 rupees, also 60 ghoonts, and much other property.

Revenue from 1839 to 1843.—From 1839 to 1843, both inclusive, an annual revenue of 2,000 rupees was paid to Rájá Goláb Singh.

Besides this, 100 sheep within the five years; and, in 1839, three Ghoonts were presented as nazzars, and one Ghoont annually for the four succeeding years.

Prior to 1839.—Before 1839 the revenues from time within memory, was always paid to the Rájá of Ladak, as follows; 396 rupees in cash, 200 lacs of grain, 100 múndís, 34 pieces of cloth (Barmúr), and 132 shógús of paper, equal to 660 Hindustáni táktehs. During these years, they also paid annually to the Rájá of Kuíou, six rupees, and two pieces of cloth, as tribute. Also to the Rájá of Busúhir 30 pieces of cloth as tribute. And to China (from 50 Chinese families settled in Spiti) about 200 lacs of grain.

This revenue to China has been discontinued for the last 12 years; but, before my arrival, some Chinese were sent from Tolung to demand the ancient tribute.

Demands of the Chinese for revenue.—Since my arrival, Vakíls have been sent to me from Tolung and Chúmúrtí, setting forth their claim to this tribute, but I told them that, as it had not been paid for the last 12 years, and the Company had the means of protecting their own subjects, that I did not think it would be continued; but that as I was not vested with political authority, I would make their request known to my superiors.

This ancient tribute does not appear to have originated with the

Chinese government, but in ancient times there were Tartar hordes upon the border, and the Spiti people appear to have paid this grain to be protected from plunder.

Revenue how hitherto collected.—The revenue of Spiti has hitherto been collected by a Vazir (hereditary); whatever revenue is required has been levied equally from the five Kotis: in the collection, he is assisted by five “Gatpos” or Múkiáhs. The Vazir has hitherto been allowed to pay himself at the rate of one rupee in four, and he holds the village of “Kíúling” in Jághir.

Amount of grain produced, and probable home consumption.—The whole five Kotis contain 2,554 lacs of ground. The probable produce of this land will be 20,667 lacs of grain, and the probable annual home consumption 15,000 lacs; which, deducting 800 lacs for the produce of the Jághir lands, will leave them 4,867 lacs to pay their revenue with; which, roughly calculated, would be about 1,600 rupees, besides the sale of Ghoonts, say 400 rupees, and any tax upon their industry.

Commerce.—The Spiti people are not essentially traders, their country affords but little pasturage, and they have seldom more sheep than to supply their own wants.

Exports.—The exports are confined to grain and a few Ghoonts, together with a few manufactured blankets, and pieces of Barmúr cloth. The return for their grain is salt, and wool. For grain they receive equal weight of salt, and for three lacs of barley they receive eight “kiris” of wool; the kíri is a Chinese weight, and differs from 12 to 16 seers.

Trade with Chinese.—The Chinese are their own carriers: they come to Spiti in November, and take about 1,000 lacs of grain, and a few Ghoonts. The Spiti people say that this trade might be increased. The Chinese do not barter “pashm” or Shawl wool, but take rupees for it.

From the Chinese, the Spiti people buy their sheep, (a very fine description) giving five lacs of grain for one sheep.

Trade with Busáhir and Lallak.—They export to Busáhir about 250 lacs of grain, chiefly to Súngnam, and receive in exchange rupees: the Busáhir people are their own carriers: a few Ghoonts are also sold. To the Busáhir people they also exchange part of the salt they

receive from China, for iron and tobacco, and a small quantity of pashm, about 12 maunds, is also exchanged for iron: if this iron is more than sufficient to supply their own wants, they trade with it to Ladak, or Rúksú, and exchange it for ornaments for their women, and other trifles.

They also exchange about 250 lacs of grain with the Tartars, from Rúksú, for wool and salt.

The usual selling price of grain amongst themselves appears to be from $2\frac{1}{2}$ to 3 lacs of barley, and 2 lacs of wheat for the rupee.

This appears to be their entire trade.

Weights and Measures.—Their measures are of three descriptions, “linear,” “agrarian,” and of solidity.

“*Linear.*”—By the linear measure, cloth is sold by the “háth” as in Hindustan. Wool is sold by what is called a “kírí” or bundle, which differs as to weight, but is two háths in length; this is used in commerce with the Chinese.

Agrarian.—The agrarian measure estimates by the quantity of grain; in Kulu it is “Bhars,” here it is by “lacs,” a lac being 32 catchá seers, or 12 pukka seers.

Capacity and Solidity.—The return of grain sown is 14 to 1 of barley, and from 10 to 12 for 1 of wheat. Gram is sold by the seer of 20 double pice weight; our seer is from 80 to 84 tolas, their seer is 32 tolas.

They have also a small measure called a “Máni” or “Thi,” which is a small wooden cup; this is of two sizes, the one used for buying, called “Chayreh,” holding 29 rupees weight of grain; and the other, by which they sell, called “Guyreh,” which only holds 21 Rs. weight; small articles of value are bought and sold by the barley-corn weight, as a grain of rice is used in Hindustan.

Liquor.—Liquor is measured by the “Puttah” of 2 seers, equal to $\frac{3}{4}$ seer pukka. Their liquor is of one kind, distilled from barley called “Chung,” and is sold 30 “puttahs” for the rupee. They consume large quantities, and one man is said to drink, on occasions of festivity, as much as four puttahs.

Domestic Animals, Cattle, &c.—Their animals consist of Yáks, Jabbús or half Yáks, Cows, Ghoonts, Asses, Sheep, Goats, Dogs, and Cats.

Yaks.—The Yâk is a highly useful animal; with it they plough, carry loads, and it furnishes milk, and hair for their ropes.

In the severest weather, this animal appears to enjoy itself in the snow, and it is often to be seen with icicles, of several inches in length, hanging to its nose, and a foot or more of ice hanging to the hair falling from its neck and shoulders. Long hair hangs over the eyes, and prevents their freezing.

Number of Yâks, Jabbûs, Cows and Ghoonts,—Chinese breed. The total number of Yâks in Spiti is 439: and of Jabbûs and Cows 412. The Ghoont, although an useful animal, seldom carries any burden but a man; the total number in Spiti is 365, but bred chiefly for sale. They have two breeds, one a small Ghoopt, never above 12 hands high, peculiar to the country. The other a large breed of Ghoonts, from 13 to 13½ hands high, is bought from the Chinese, and usually comes from “Chúmurti.” For a Chinese Ghoont two years old, they give a four year old Spiti Ghoont. All are equally hardy, and are kept out the whole winter,—all except the yearlings, which are housed. During winter, the Ghoonts live entirely upon the roots of stunted bushes, and are very expert at scraping the snow from off them with their fore feet.

But little attention, except in a few cases, is paid to the breeding of these Ghoonts; a certain number of entire Ghoonts are turned loose amongst the mares, and the sire of a foal is seldom known. Such as are not required for breeding, are castrated when between two and three years of age.

The right of castration has usually been the right of one person, given under a seal from Ladak.

The breed of Ghoonts with a little care might be considerably improved. Many are killed during winter by wolves and leopards, and I saw some which had been much lacerated, but escaped.

Asses.—The ass is also an useful animal, and is of a peculiarly strong breed, not in general large, but with powerful limbs; they are chiefly employed to carry firewood, and are said to be able to go wherever a sheep can: their milk is also drunk. The total number in Spiti is 79.

Sheep and Goats.—The sheep appear to be of two distinct breeds; the common one produces the fine “Biánghy” wool, the other is

a very large species which is brought from "Chúmúrti" with very long wool, but not so fine as the other.

The goat is of the description which produces the Shawl wool or pashm. The total number of sheep and goats in Spiti is 1095.

The Spiti people are not carriers, or they would have a larger number of sheep. Each village has its three or four dogs, and a very fine black species of cat: these I think comprise all their domestic animals.

Zoology.—I am here at a very unfavorable season of the year to make any observations, either on the Zoology or Botany of the country; in fact, with the latter science I am unacquainted, and, with regard to the former, having been a keen observer through these mountains, I have been struck with but two new species of bird of the genera "Erythrospiza," and "Ruticilla," every thing else that I have seen is well known and described.

Physical constitution, morals, manners, &c. of the people.—The position of Spiti, situated amongst ranges of high mountains, subject to extreme cold, and far from civilization, points out in a degree the physical constitution of its inhabitants.

The Bhotiás are a physically robust cast of people, the climate not being sufficiently severe to impede the vital functions; with strongly marked weather-beaten countenances; of middling height; with muscular body, flat faces and noses, and, in general, small eyes. The natural colour of their skin is a light brown, and the reflection of the sun from the snow gives them a ruddy hue, which is so peculiar to all the race of Butan. Their hair from exposure to the atmosphere is extremely coarse and matted. The women are also very muscular, and all burdens, except in cases of extreme necessity, are carried by them, the men merely ploughing the fields. They are not subject to much disease, and live usually to 70 years of age.

Diseases.—Small-pox is their greatest enemy, which occasionally depopulates whole villages. Stomach diseases are not uncommon and which may be increased perhaps by the entire want of vegetables. Weakness of the eyes is also common. Although depending entirely on snow and ice water, and in a country of lime-stone goitre is scarcely known; one or two cases, they say, may exist in the whole country.

Ages of Marriage.—The common ages of marriage are, with the men, from 20 to 21, and women from 15 to 20.

Polyandrisms.—The abominable custom of polyandrisms prevails, that is, a woman marries a family of brothers.

A man in good circumstances has sometimes two or three wives; but, from the first circumstance, and the priesthood not marrying, the proportion of unmarried females is large.

Slavery unknown.—Slavery is unknown amongst them. They are free in their manners, without being rude, or inquisitive; and have a certain degree of Chinese cunning.

No interest taken for money.—They never take interest for money, but often lend and borrow amongst themselves.

Houses.—Their houses are large and well built, and generally two or three stories high. The first three feet built of stone, and the remainder of sun dried bricks, 18 inches long, 8 wide, and 6 deep, cemented with calcareous mortar. The roofs are flat, with a layer of willow or tamarisk twigs, over which is about 6 inches of earth. On the outer walls are usually deposited grass and wood for winter use, and the houses of the richer zemindars are always distinguished by the neatness with which this is stored. This keeps the snow off their walls. One room in a house is usually 20 feet square, or 24 by 20, the roof supported by a double row of wooden pillars, the architrave being, in the better houses, highly carved in Chinese style, in the form of dragons, &c. The two centre beams, are about 2 feet apart, and over these, to form a ceiling, willow or juniper sticks, peeled of their bark, are crossed, and placed close together giving a neat and cleanly appearance; this however is much destroyed by the lighting of fires in the room, and there being no exit for the smoke, except by the door and some very small windows, which are usually on only one side of the room. The walls are generally washed with a slate-colored marl, and a cornice imitated by a band of white and red, sometimes yellow, made from gypsum, and red and yellow ochre. Generally speaking they are extremely well housed. On the outside corners of the houses are usually erected poles, with a black Yák's tail on each. The whole family live in one house, consisting usually of a grandfather and mother down to the grandson, &c.

Khatak presented, a Chinese custom.—When the parties can afford it, distinct buildings, but close together, are occupied; the grandparents occupying the second best. If they die, the father occupies

his father's quarters, and the younger couple the best. Such are their arrangements. They appear to live happily together, seldom quarrel, and crimes are very uncommon. Their customs are essentially Chinese, and I was always presented with a "Khatak," or white silk scarf, by every head of a village.

Mode of reckoning time.—Their mode of reckoning time is by lunar months of 29 and 30 days alternately, and every three years they add a month to reconcile the motions of the sun and moon. Their present Samvat (Kilú) commenced on the 15th of December.

Mode of detecting crime and oath.—When two parties are accused of crime, an oath is taken in the following manner. The names of each are written on paper or engraved on stone, then wrapped up in flour, and either thrown into hot oil, or water, a person then plunges in his hand, and the first name that comes up is considered the guiltless person.

Petty thefts punished by fine.—Petty thefts are punished by fines.

A person dying without an heir, the personal property goes to the Lambas.

Crimes how punished.—If a woman deserts her husband, and goes to another man, the man pays the expenses that have been incurred by the husband, with an occasional fine, according to circumstances.

Bad crimes, as maiming, wounding or murder, have hitherto been punished by orders from Ladák, generally by the cutting off a hand.

Amusements.—Shooting with a bow and arrow is one of their favorite pastimes; the implements are of Chinese manufacture. A sort of religio-dramatic performance constantly takes place, the actors are Lambas, who repeat religious sentences, and are joined in a chorus by the crowd; on these occasions grain is bestowed, and every donor's name registered in a book kept in the gúmpáh or the kúrdewaráh.

Dress.—All are clothed in woollen coarse cloth and blanket at all seasons, and in winter, a goat or sheep skin cloak reaching from head to near the feet, the hair inside. The women wear a sort of loose wrapper with arms, extending to below the knee, bound round the waist with usually a red coarse shawl of pashm; loose trowsers usually red, which are gathered close below the knee, and stuffed into a pair of cloth leggings attached to a large Chinese shaped shoe, (these leggings answering for stockings,) and tied round the calf of the leg

with a woollen string. The shoe is made large and the vacuum filled with búśá or wool.

Their heads are usually bare, but they have a large moveable ornament made of brass, or sometimes of silver and gold, studded with a variety of turquoises, which extends from the forehead over the parting of the hair, and reaches in a long tail behind. They wear their hair long in a number of plaits. They also wear a variety of necklaces of amber, coral, &c. ; and coral earrings and wrist ornaments cut from the chalk shell. No woman is without these ornaments. The higher class sometimes wear a kind of cap made of Kimkhab and trimmed with sable fur, but these are seldom seen ; a woman may be said almost always to appear with a bare head : they are in no way secluded, and are free and frank in their manners, and of very cheerful disposition.

The dress of the men much resembles that of the women, but their heads are generally covered with a sheep skin cap, or one of black blanket hanging loose, with a light blue border. Many wear their hair in one long platted tail, with, occasionally, turquoises and corals. They have all a necklace of coarse amber and other beads. They also wear, suspended round their waist, a flint and steel, and round their necks a polished piece of brass which serves as a looking glass, and various charms.

The Lambas have a variety of head dresses, but all in the Chinese style, either a cap or a hat.

Food.—Their food consists almost entirely of a sort of Sattú, made from wheat, barley, or peas. They occasionally eat meat boiled into a soup ; and drink quantities of tea, boiled with butter and salt. Yák's flesh is eaten without prejudice ; but, in killing any animal they abstain from shedding blood, and usually strangle. They have no poultry ; in fact I doubt if fowls would live. They have not a fruit or vegetable in their country. Turnips, which are cultivated in Kunnáwar, are not seen here. I think that cabbages and beet root might be introduced here with great advantage to the health of the people. Potatoes would not thrive, the cold being too severe. Tobacco is smoked by nearly every man, who has a pipe made of iron stuck into his cammarband, and a leather pouch for his tobacco.

Religious Institutions.—The faith of all the inhabitants of Spiti is "Buddhism." The priesthood form a large portion of such a small

population, there being nearly 200 distributed in the five Kotis. They consist of a Head Gelong, who is their guru or high priest: under him again are five other Gelongs, and all the rest are "Chunbás" and "Cheláhs." The two last or inferior orders can be made here, but a priest must go to Lahassa to be made a Gelong, by the Teshú Lambú. The "Cheláhs" are made indiscriminately from the peasantry. In Spiti there are five Gumpás or Thákúrdewaráhs, each having its Gelong. All these are under the orders of the Teshú Lambú at Lahassa. The priests must either be clothed in red, or yellow, and on no account wear white; their head dresses are very various. They are strictly prohibited from exercising any other functions but those of religion. They are entirely supported by the people, and they collect grain for their support at harvest time from the people; they have a store room to each Gumpá. The Chinese families settled in Spiti are called "Chuji," and they present annually, 200 lacs of grain to the head Gumpá. The priests are prohibited from marrying; if they do, or are known to have connexion with a woman, they are beaten and dismissed from the order. There are however two sects of Lambas; one called "Neingmá" answering to the Byrágis of Hindustan; who though not allowed to marry, are allowed to keep women; there are only 13 of this sect in Spiti.

The other sect is the "Gilopá" who represent the Sannyásies: they consider themselves defiled if they touch a woman. The "Neingmá" sect generally wear long hair, and the other short. They dispute with one another as to their superiority of learning.

The priest attend at births, marriages, and deaths: at a birth, several priests are called, who go through a ceremony of astrology predicting the fortune of the child, and receive presents.

Parties are married by a guru in the open air, when prayers are read; the tilak is then marked on their foreheads, they have "Khataks" (white silk scarfs) given to them by the guru, when they get to their house, and he departs with presents. At a funeral a Lamba attends whilst the body is burnt. The guru and other priests then attend, and presents are distributed. The ashes are thrown into a river, and the place where they were burnt, heaped over with cow dung and clay; and, if the friends of the deceased can afford it, a monument is erected in the shape of an urn. There are no nunneries or nuns in Spiti.

They believe in one God Supreme, but have a variety of inferior divinities, which are represented in their temples. Prayers and charity are, in their estimation, sufficient to ensure happiness in another world.

They believe in various births hereafter: that a man's span in this world is 70 years: but in the second it will be 60, the third 50, and so on till 10, when a man is only to be a háth ($1\frac{1}{2}$ ft.) in height. They believe in many yugs; they say that only three have arrived, and that nine hundred and ninety-seven are yet to come. Metempsychosis forms a part of their belief, but they are not explanatory on the subject, and say that only the Teshú Lambú can explain it. It is rather extraordinary with this belief that they should eat the flesh of animals, which they will not kill, but receive to be eaten when they have been killed, or have died. The store-house of the Gumpá has a large supply of dried dead animals, and pieces of flesh strung and dried.

Once a month, the whole of the priests assemble for general prayer, it is first read by the Gelong, and repeated by all the rest. Their most remarkable festivals are usually at the full moon.

This is all the information which I have thought it necessary at present to collect, regarding their religious institutions and customs. The Lambas are quiet and inoffensive, and much respected by the people generally.

If the country is highly taxed, it will be necessary to make some provision for the priesthood in the shape of Júghír.

Lahassa is called by the people here "Chotá Chín," and the country between Lahassa and Mánassarovar or "Mantaloi," is called "Guari." China Proper is called "Gynuk." The country of Little Tibet is called "Bálti," or that portion above Cashmere, &c. The Ladak country goes by its own name.

Climate.—Having no Barometer with me, I am unable to ascertain the atmospheric pressure, but with a Thermometer only graduated to Zero, I have, as regularly as I could, taken the temperature of the air since my arrival; always morning and evening, but being generally on the march at mid-day, I have not often been able to ascertain it at that time. I give in a table (No. 2) the range as observed, which will point out the winter climate as being very severe. The diminution of atmospheric pressure is inimical to the growth of trees, and there are only to be found a few stunted trees of "Juniperus excelsa" and willows.

The prevailing winds are from South to East, and at times very high, and the greater portion of the tops of the higher mountains have all the snow swept off by the wind. I remark particularly in Spiti, what struck me so much last July in Lahoul, and especially North of the Bará Lachá, that the soil gives out much heat by radiation. The want of heat and atmospheric pressure are, in these regions, greatly against vegetation.

Having given a succinct account of this country and its people, I may sum it up by saying, that Spiti is a mass of nearly bare rocks, with here and there small patches of cultivation, almost entirely without trees, thinly populated, and small villages, the largest not having above 25 houses. The table which I annex will give the number and houses of the villages.

I have now but to add a sketch map of the country, such as will afford a reference to villages. I do not profess to give the mountains in their proper form or distinct ramifications. I have taken regular angles; but, without a protractor, cannot lay them down; besides, that task has most likely been already done, and much better done than with my opportunities or resources, I could hope to perform it.

Conclusion.—I trust that any deficiencies in this report will be excused. I have no proper paper; my hands are so benumbed with cold, that I can with difficulty write, and the ink freezes in my pen at every two or three words. I have had no books or maps to guide me, and am in perfect ignorance of any thing that may have hitherto been written: all is from my own unguided observation. I should, upon the whole, say that the country is in a prosperous state, the people are well housed, well clothed, and possess an abundance of food, such as they are accustomed to: they are contented and happy, with principles of order and industry; and, with a moderate taxation, I think they will prove good subjects, and useful and beneficial to the Government to which they are now annexed.

Having thus stated facts, which I was alone ordered to collect, with a view to enable a future settlement to be made, however incomplete these may be, though collected to the best of my ability, I trust that my superiors will be able to form a judgment both of the country and its people.

(Signed) W. E. HAY,
Assistant Commissioner.

TABLE NO. 1.

List of the Kotis in Spiti, with the Villages, and quantity of land under Cultivation.

<i>Names of Kotis.</i>	<i>Names of Villages.</i>	<i>Quantity of land cultivated.</i>
Shámpáh,	Seri,.....	41 Lacs.
	Fokpáh,	37 "
	Omarungpá,	4 "
	Mániyugmá,	120 "
	Mánikugmá,	97 "
	Dankar,	107 "
	Sircári land at Dankar, ..	35 "
	Chunchugmáh,	1 "
	Ludupding,.....	2 "
	Nagupar,.....	1 "
	Rámá,	8 "
	Lidang,	6 ,, 10 patas.
		<hr/> 459 10
Piná or Pinpa,.....	Tungtuyugmá,	51 "
	Tungta Kugmá,	21 "
	Silung,.....	25 "
	Kuling,	46 "
	In Jagir to Tunjun Shu- pal,	11 "
	Jhutá,.....	16 "
	Parh,	68 "
	Kungri,	45 "
	Sunglum,.....	84 "
	Khur,	56 "
	Tiling,	45 "
	Bhugjung,	8 "
	Tudnum,.....	22 "
	Mudh,	37 "
	Shung,.....	2 "
	Chudung,	8 "
	Akchi,.....	2 "
	Mikam,	3 "
	Chomuling Kugmá,	2 "
	Mikam Yugmá,	2 "
	Dhunja,	3 "
	Halungchi,	4 "
	Yunum,	2 "
	Chomuling Yugmá,	1 "
		<hr/> 564 "

<i>Names of Kotis.</i>	<i>Names of Villages.</i>	<i>Quantity of land cultivated.</i>
Purchikpah,	Lilung,	118 Lacs.
	Gienmull,	92 „
	In Jagir to Kulzung,....	12 „
	Chubrang,	4 „
	Sanglóa,	4 „
	Lerá,	57 „
	Kájeh,	80 „
	In Jaghir to Nunáo Kul-	
	zung,	10 „
	Quong,	16 „
Potepáh,	Küiling in Jagir to Nunu	
	Kulzung the Vezir,....	36 „
		<hr/>
		429 „
		<hr/>
	Rangrik,	149 „
	Chikim,	100 „
	Kibar,	182 „
	Kiotu,	40 „
	Sumling,	36 „
Chujeh,		<hr/>
		507 „
		<hr/>
	Tungpá langchi,	65 „
	Echim,	48 „
	Yulelúm,	31 „
	Kumik,	58 „
	Half of Lidang'is in the Shámpáh Koti }	Lidang,
		27 „
		Tabá,
		33 „
		Kurik,
		61 „
		Ki,
		42 „
		Geoti,
		7 „
	Munni,	14 „
	Ull,	50 „
	Pagmu,	19 „
	Chikzá,	3 „
	Hansi,	62 „
	Kaómá,	13 „
	Lohaaz,	60 „
	Kolakzuz,	2 „
		<hr/>
		595 0

Total in the 5 Kotis, .. 2554 10 or Bhara 319288 patah.

TABLE NO. 2.

Range of Thermometer in Spiti from the 9th December, 1849, to the 15th of January, 1850, exposed to the Sun.

Date.		At 6 A. M.	Noon.	6 P. M.	
December, 1849,	9th	14	48'	24'	Snow.
	10th	14	not observed	23'	
	11th	17	"	22'	
	12th	10	72'	18'	
	13th	6	74'	20'	Snow.
	14th	10	63'	16'	
	15th	6	"	17'	
	16th	4	"	14'	
	17th	12	"	21'	
	18th	14 Cloudy	34'	18'	
	19th	13	"	21'	
	20th	12	"	19'	
	21st	11	58'	25'	
	22nd	13	68'	22'	
	23rd	14	"	24'	
	24th	14	"	20'	
	25th	6	32'	20'	
	26th	6	"	14'	
	27th	4	"	24'	
	28th	4	"	12'	
	29th	at Zero.	"	18'	
	30th	18	"	22'	
	31st	12	"	6'	Snow.
January, 1850.	1st	at Zero.	"	6'	Snow.
	2nd	12	"	6'	Snow.
	3rd	14	30'	14'	Snow.
	4th	13	28'	18'	Snow.
	5th	10	29'	13'	Snow.
	6th	at Zero.	46'	12'	Fair.
	7th	8	56'	13'	Snow.
	8th	13	23'	11'	Snow.
	9th	6	24'	18'	Snow.
	10th	18	28'	16'	Snow.
	11th	15	27'	13'	Snow.
	12th	14	22'	7'	Snow.
	13th	at Zero.	53'	11'	Fair.
	14th	6	56'	10'	Fair.
	15th	4	20'	10'	Snow.
	16th	2	20'		

True Copy.

(Signed) D. F. McLEOD,
*Commissioner and Superintendent,
 Trans Sutlej States.*

True Copy.

P. MELVILLE,
Secretary to the Board.

Examination of the New Mineral HAUGHTONITE (a compound of Carbonate of Lead and Sulphate of Barytes).—By HENRY PIDDINGTON, Esq. Curator, Museum of Economic Geology.

Amongst a few common rocks and minerals presented by Lieut. Haughton, Assist. to the G. G. Agent N. W. Frontier, on his departure for the Cape, I found a coarse, dirty-white, earthy looking mineral, which, judging only from its weight, might be taken for either an ore of lead or one of barytes, but on examination it proves to be a compound of both which I nowhere find described, and I thus deem it due to Lieut. Haughton to put upon record my examination of it, in hopes that we may in future obtain more and better specimens so as to enable us to pronounce more positively upon it than we can now do.

Our specimen is apparently the remains of an oblique rhomboidal table, much broken down by exposure to the atmosphere or to the action of water, and decomposing externally.

Its *external* colour, feel, soiling, and hardness when scraped, are exactly those of an impure earthy chalk; but in our specimen there are set numerous minute nodules (not exceeding a hemp seed in size) of a harder kind of the same mineral, and when a surface is scraped these shew a dull clayey shade, as if they were nodules of hard clay, though they are not so.

Its fracture^e, seen on a very small surface, is coarse hackly, and it is of some considerable toughness. It shews also in the fracture thin brown coloured veins, such as are sometimes seen in common earthy iron ores from vegetable matter.

It is externally very friable and soiling. It adheres a little to the tongue and feels heavy. The internal colour is that of a dull dirty fawn-coloured claystone, the lustre earthy, but perhaps in a strong light a little saccharine.

The smell is very remarkable, being oily and rancid, as if oil had been spilled upon it, and this especially when it is pulverised or heated high enough to drive off the water.

The powder is of a dull, yellowish-white colour. The external chalky surface then, is that of the decomposed mineral, which in some parts is 0. 2 or 0. 3 of an inch in depth. Its specific Gravity is but

3. 43; but it is apparently cellular, and if allowed to imbibe water for a few days might give a higher one.*

Blowpipe Examination.

In the forceps it blackens, softens and sometimes exfoliates a little, or a piece flies off. The most remarkable characters are the blackening and softening, by which last the points of the forceps are deeply impressed into the assay.

The blackened assay affords no trace of a sulphuret, and in the reducing flame the blackness soon goes off, leaving the whole mineral of a dirty greyish-white. It just fuses on the edges only, to a white enamel, like common heavy spar.

With Carbonate of Soda on charcoal, the usual brown sulphuretted bead of the sulphates, with their smell, &c. is immediately obtained.

With Borax a clear glass.

Via Humida.

Digested with Nitric Acid it effervesces slowly, and the filtered solution, when tested, gives the usual re-actions of lead, with a little iron; the lead perfectly well marked by Chromate and Hydriodate of Potash as also by sulphuretted Hydrogen. The greater part of the assay however remains upon the filter, and this, when fused with the Carbonates of Soda and Potash, gives Sulphuric Acid and Carbonate of Barytes.

By the only analysis for which I could afford an assay from so small and precious a specimen, I find it to contain per Cent.

Sulphate of Barytes,	83.52
Carbonate of Lead,	6.23
Oxide of Iron, .....	.75
Water, Organic matter† and loss,	9.50
	<hr/>
	100.00

* Which I would not risk lest it should fall to pieces, which its earthy chalk-like texture renders probable.

† As inferred from the blackening and smell, but this is by no means certain, as we have minerals in which blackening takes place from the mere separation of water or even without it; but the high per centage of the water, after the usual drying for mere Hygrometric water, would induce the belief that something more existed.

But these are only to be taken as approximative quantities, for the specimen, from its blackening which takes place in the crucible when the lead has been separated, evidently contains some peculiar matter, and the quantity of water which rises as it approaches the low red heat at which the blackening goes off is very remarkable.

As above mentioned, we cannot afford to sacrifice any more of this curious specimen for examination, and I should moreover remark that a portion of the external decomposed white crust was unavoidably taken in the analysis made. We have a right however to claim the discovery of it for Lieut. Haughton, and I have therefore named it, provisionally, HAUGHTONITE.

Note on an Inscription engraved upon a brick, found some years ago in a field near a village in the Jaunpur district by Captain M. Kittoe, with a transcript from the original by Hiranand Pandit, and a translation by James Ballantyne, Esq. L. L. D., Principal of the Benares College.—By Captain M. KITTOE.

Sanskrit.

सन्ति सम्बत् १२७३ आषाढ शुदि ६ रवौ । अद्येह मयूनगर्यां धनि
कौ नाम्ना मतौ । राश्रीकक्षो राश्रीमहदित्यौ । राडोविमुतौ स्वधनं
प्रयुञ्जते । अतस्सकाशाद्वारणिको नाम्ना मतः । रासंगदेवो राधानुसुतः
षडोदिकद्रम्मसहस्रद्वयसार्द्धशतद्वयं गृह्णात्युद्धारेणाङ्गेपि द्र २२५०
अमोषां द्रम्माणां विश्वासार्थं च प्रवापिणीस्वकपट्टिकावन्धके प्रदत्ता ॥
अस्मिन्पत्रे चोद्धारणिकहस्तेन स्वमतं मारोपयति मतं मम । अत्राप्ते
राणकश्रीवाघदेवः ॥ राजोपरोक्षेण रादेवादित्य राधौरि राकुमनपाल
राविलास राप्रजयन् एते साक्षिणः कृताः पूताश्च लिखितं चेदमुभ-
यानुमतेन ढिवाश्रीसीढलेन ढिवाहाटपुत्रेण दिग्धाक्षरमविवृताक्षरं
वा ततोपि प्रमाणमिति ॥

English Translation.

May it be auspicious! In the year (Samvat) 1273 (A. D. 1216), on Sunday, the 6th of the light half of Ashád, this day, here, in the city of Mayu, the two bankers known by the names of Rá Sri Bahma and Rá Sri Maháditya, the two sons of Rá Dovi, are turning their money to account (as follows). The borrower from them, known by

the name of Rá-Gangádéva, son of Rá Dhamí, takes as a loan two thousand two hundred and fifty Shadboddika (?) drummas—(in figures) 2,250; and as security for these drummas, he gives in pledge his cultivated and other lands. And on this deed (inscribed brick), by his own hand, the borrower places his assent thus—"This is my agreement." The surety, in this case, is Ranuck, Sri-Bághadeva, such a one as a king might be content with;—Rá-Devaditya, Rá-Dhauri, Rá-Kumanapála, Rá-Vilása, and Rá-Prajayan—these are made witnesses—worthy men. And this is written, with the consent of both parties, by Dhívá-Sri-Siḍhaal, son of Dhívá-Háṭa. If the letters get smudged or obliterated, still the matter can be certified by these (i. e. by the writer and the witnesses).

Note.

The above inscription, which may not be considered altogether as uninteresting, is engraved on a large brick 1 ft. 3 in. by 1 ft. ; 3 in. in thickness. It is not an ordinary brick, but evidently made for the purpose; the writing has been done with a style when the clay was still damp, and has then been baked; but being of a soft clay and indifferently burnt, many of the letters have been much worn: yet, it is for the most part sufficiently clear to admit of its being easily made out. The character is that peculiar to Rájá Jayachandra's time, differing but slightly from modern Deva Nágri, with the vowel marks of *ai* and *ao* carried behind the preceding letter as in modern Bengali; for instance ऐ is written (ऐ, and औ is written (औ. This peculiarity may be taken as a fair guide for fixing the approximate date of inscriptions in which dates are wanting; it appears to have fallen entirely into disuse in the latter part of Rájá Jayachandra's reign. But to return to our brick, I have heard that such are not of uncommon occurrence in this neighbourhood; but I have failed in obtaining any other specimen, and it was not without difficulty I procured this, as a superstitious veneration is attached to them simply because few can read and less understand them. They are generally supposed to be keys to hidden treasure.

The simple publication of the text and translation of an ancient inscription would at first appear to be of little moment—but the contents must be considered, and deductions drawn therefrom, which is the plan I have hitherto adopted. First then, we have a clear date, viz.

Samvat 1273 or A. D. 1216; the character is, as I have above mentioned, the nearest approach to modern Deva Nāgri, the last shade of transition from the "*Gowr*" or "*Kútila*" of the inscriptions of the 9th and 10th centuries. No deity in particular is here invoked, by which we could speculate upon the creed of the parties concerned, or of the prevailing worship of the day—but the prefix is the mystic "*Aum*." So that we may suppose them to have been Saivas, though it is not confined to them only. I should mention that inscriptions of this period have often the indefinite 'salutation of "praises be" and "praises be to whomsoever." From this it may be inferred that at that period, public opinion was divided as to which should prevail of several creeds. In Jayachandra's time the Buddhists were greatly persecuted, *ergo* they must have existed (probably in large numbers at so late a date, though the orthodox Hindus would deny this fact.)

We learn further from this inscription that the usage of mortgages prevailed as early as the 13th century, and that engraving the deeds, and probably burying the same in some spot on the land mortgaged, was common; the form is simple, and bears the stamp of honesty; it is drawn up, signed, and agreed to, before witnesses, and securities furnished for the fulfilment of the agreement. No registry is mentioned, though such a practice, at courts, prevailed as far back as the 4th and 5th centuries: two such documents engraved on copper are in my possession. If the registry was made on bricks of the same bulk as that of the subject of our remarks, the Registrar would soon have had materials to build a house with.

We learn that the currency was termed "*drummas*," in this instance "*Shadboddika drummu*;" but the meaning of the term cannot be made out by the pundits, who suggest that a "*drumma*" must be some given number of cowries, such as the "*gandús*" and "*chaddúms*" of modern times.

We are indebted to that talented scholar, Dr. J. Ballantyne, Principal of the Benares College, not only for the present translation, but for several others of lengthy inscriptions, from Gayá and other places, which I hope to lay before the Society at an early date; and I must here also acknowledge the services of pandit Hirúnand, also of the College, who is the only one who has been successful in decyphering ancient characters.

K. M.

Answers to Mr. Piddington's Query about Winds, Storms &c. in Thibet, by A. CAMPBELL. ESQ. M. D., Superintendent of Darjeeling.

To the Secretary of the Asiatic Society, Calcutta.

Darjeeling, Oct. 1st, 1850.

DEAR SIR,—In the third number of the Journal for 1850, there is a Memorandum, by Mr. Piddington, on the storms of wind experienced in Tartary, with a series of questions regarding them, to which he wished to have had replies from the late Thibet Mission.

The replies, if procured by the mission, have not been published. The mission however made its observations in Western Thibet only, having been foiled in its Eastern progress. It will therefore be the less necessary to apologize for intruding on the Society with a few imperfect replies to those questions, having reference to Eastern Thibet, the Southern out-skirt of which I visited last October, in company with my friend Dr. Hooker. The following replies are a running answer in regular sequence to as many of the 37 questions of Mr. Piddington as I have notes or other means of dealing with. The person alluded to as my informant, and who experienced a severe storm in Thibet, is a Bhotia friend of mine, who accompanied Dr. Hooker and myself on our journey, and is a very credible person. It was at Dochen, 32 miles from Phári*, that he encountered the gale, and the date of its commencement was the 7th of Mágh, Samvat, 1903. January 19th, A. D. 1847.

The portion of Thibet to which the replies refer, is composed of two extensive provinces and the trans-Himalayan tract of Dingcham; viz. "U" or "Oo," and "Chang," in some maps put down unitedly as U-Chang, in others as Utsang. "Oo" is the Eastern Province, with Lassa as its principal city. "Chang" the Northern and Western one, with Digarchi and Giangtchi as its principal towns. The mean elevation of these provinces is unknown. The cultivated portions may be 14,000 feet, for at 16,000 feet in Dingcham, wheat does not ripen. The district or tract named Dingcham lies along the Northern aspect of the Ilímálaya, extending from Tawang on the East, to the Meridian of Jumlá on the West, an extent of 360 miles or thereabouts. It comprises Phári, Dochen, the Ramchú Lakes from which the Painom river rises, Bumtso, Gerre, Kanbajong, Dobtá, Sareh, and the Tingri

* For these places see Route to Lassa, J. A. S. for 1848.

Maidan. The mean elevation may be 16,000 feet. Bumtso which is an easy ascent, and does not by any means appear as a mountain in Dingcham, was reckoned by Dr. Hooker, by rough calculation of Barometrical observations to be 18,400 feet above the level of the sea. When we were at Bumtso on the 18th of October last, the Thermometer at 11 A. M. in the open air stood at 44°, the wet bulb at the same time being at 22° on the night before; in the vicinity of Cholámú 17,000 feet, the temperature fell to 5°. These particulars relating to the "elevation, cold, and dryness of the air" on which stress is laid by Mr. Piddington in connection with his questions, were given to me by Dr. Hooker on our journey, and are subject to his corrections when his meteorological observations are worked out.

Your's very truly,

A. CAMPBELL.

Answers to Mr. Piddington's Questions about Winds, Storms, &c. in Thibet, by A. CAMPBELL, M. D. Superintendent of Darjeeling.

The names by which the different kinds of wind are known in Thibet, are "Babink"—violent storms or whirlwinds; "Lhapa," a storm or whirlwind of less degree; "Lúmbú," ordinary wind. These are Thibetan names indicative of different degrees of intensity in the wind, and have reference to their character only—not to their effects, on objects. The "Babiuk," is generally preceded by a noise resembling the clatter of galloping horses which intermits: it comes on sometimes quite instantaneously, and lasts for all periods from an hour to three days. It has been known to last for seven days even. Storms occur but rarely between May and October, but frequently during the remainder of the year. The general direction of storms is from the West and South West, and so it is indeed of the ordinary wind also. The whirlwinds have not been observed to have any general direction onward, nor is it known which way they turn. They form suddenly on the open places, and mountain passes; the traveller sees the column of dust afar off; if on horseback he instantly dismounts, and crouches to the lee of his beast; if on foot he throws himself on his face on the ground, till it has passed over him. Dust, dry grass, pebbles, and even stones are taken up and carried in these whirlwinds, which are very frequent, and never accompanied by rain or snow. The god of the winds is named "Lúmlá" or "Lúnglá." The god of fire "Meh-lá." The god of

water “Chú-lá.” The god of earth “Sahila-mú.” There are no temples to, or images of, the spirit of the winds, but he is worshipped, and propitiatory offerings are made to him. All sicknesses are supposed to proceed from the gods of the four elements, or to be influenced by them, viz. earth, air or wind, fire, and water; and they are propitiated accordingly with reference to the ailment. The spirit of the winds is invoked in all affections of the breathing or chest; the god of fire in fevers and inflammations; the “Chúlá” in all affections of the fluids, such as dropsy, retention of urine, hemorrhages; and the god of earth in diseases of the solids, such as rheumatism, tumours, &c. In other diseases not distinctly referable to any one of these four deities, or to the elements over which they preside, the Lamas are first consulted, and as they may indicate, so is the deity to be worshipped.

Sacrifices are not performed in any part of Thibet, either to deities or demons. The propitiatory offerings are merely balls of flour, and water, and are cast away, when offered. Storms always begin in the West, and blow from the same quarter all through, changing only a little to the South or North. They are not supposed to be at all influenced in their occurrences by the time of the moon, as they occur at all periods of her increase and decline. It cannot be ascertained how often they occur in the year; as periodical gales like our equinoctial ones in India, seem not to be reckoned on; but once in 5, 7, or 9 years, there are many tremendous storms in Thibet, accompanied by heavy snow, when great loss of life is sustained. These storms are called “Kang-mo-chi.” There was one in January, 1847, in the district of Dingcham.* They are accompanied by hail when they occur in the spring. Travellers and horses are suddenly overwhelmed in the snow storms from the enormous drift. This occurs principally at the passes of the Himálaya, and sometimes in crossing the Karúlá, and Kambolá ranges. They are generally preceded by peculiar appearances of the clouds which experienced travellers know at once, and no one else can distinguish. My informant experienced one of these storms and describes it as follows,† “I was fortunately in a house when it commenced; it lasted two days and two nights; it was most violent during the day, and moderated each night about 11 or 12 o’clock, going on again from daylight with increased intensity until noon when it was at its worst, and about two

. * See preceding letter.

† On the 19th January, 1847.

hours afternoon, on the second day it began to decline. It blew from the west and south-west." Tame animals are often killed in these storms. The wind destroys their eyes, and they lie down to die. The Kiang wild ass seems to resist their effects better than other wild animals, many of which are often found dead after they subside. There is no thunder or lightning either before, during, or after the greatest winter storms. In the lighter ones which occur in April and May, there is occasionally some thunder; but thunder is rare in Thibet. Storms are most violent in mountain passes; but in the open places they are very bad also. They are most violent in the district of Dingcham, less so in the Province of Chang, least so in "U" or "Oo"—indeed at Lassa, the capital of Province U, storms are very rare. No volcanoes are known in eastern Thibet, nor are there any other phenomena referred to, as accompanying the storms. The district of Kampá, a portion of which lies between the Provinces of "Chang" and "U," is next to Dingcham for storms, and the "Karoola" range which divides these two Provinces and is crossed on the road to Lassa, is the worst and most dangerous place for storms in all Thibet; but it is not so bad as the Dawkia, or Tunkala passes of the Himalaya, where the snow falls much faster and heavier than on any Thibetan mountains.

A. CAMPBELL.

Note by Mr. PIDDINGTON.

This note of Dr. Campbell's is of very great interest, affording us, as it does, a fair field for surmise that the inland storms of Thibet, and probably therefore those of Tartary and Siberia, may be, as conjectured, parts of revolving storms.

For if we take the Northern boundary of the Chang country (called Z'Zang in a French Atlas of 1840 before me) to be in about Lat 31° North, a revolving storm of which the centre was passing between 31° and 35° , or more North, would give Westerly gales to the whole district of Chang, and if these began at W. S. W. and veered to West and W. N. W. then the track would be from the Westward to the Eastward. If however we take the Bhotia's description to have literally and exactly given the veering of the wind "from the West and South West" then the course of that storm was *from* the E. N. E. to the W. S. W. Its great duration was owing to its slow motion or to its extent. The Bhotia's statement that the "Babink" or violent storm or whirlwind, "is generally preceded by a noise resembling the clatter of galloping horses which intermits," fantastic as it at first sight appears to us, is exactly in other words the Chinese fisherman's atmospheric warning noises as described by Dr. Morrison, and quoted by me.* "Slight noises heard at intervals a few days before, wheeling round and stopping quick, and also a thick muddy atmosphere," and with allowance for the difference between the open atmosphere of the sea and the mountain ranges of Thibet, the "distinct roar of the elements, as of winds rushing through a hollow vault" described by Mr. Gittens of Barbadoes, and quoted in Col. Reid's work, and probably also the "moaning noise" which has been several times very distinctly heard and noticed by good observers at Calcutta, in the Phillippines, at Baticolo and in the Southern Indian Ocean on the approach of a Cyclone.

* Sailor's Horn Book, p. 245, 2nd Ed.

Aborigines of the South. By B. H. HODGSON, Esq., Darjiling.

<i>English.</i>	<i>Malabar.</i>	<i>Singalese.</i>
Air,	Akayam,	Hulanga.
Ant,	Erumbu,	Kúmbeyá.
Arrow,	Ambu, Kanri, At-thiram, Pasam,	Sare ; or Iyá.
Bird,	Kuruvi, Pullu,	Kurullá.
Blood,	Irat-tham, Uthiram, Kuruthi,	Lé.
Boat,	Thoni, Odam, Morak-kalam,	Arua.
Bone,	Elumbu, At-thi,	Atá.
Buffaloe,	Erumei,	Miharaká.
Cat,	Púnei,	Balalá.
Cow,	Pasú, Au,	Eladena, [gawa, is the generic term.]
Crow,	Kákam, Kakkei,	Kaputá, kakká.
Day,	Naul, Thenam,	Dawasa ; diná.
Dog,	Noy, Suvanam,	Ballá.
Ear,	Káthu, Sevi,	Kana.
Earth,	Púmi, Puvi, Prithivi, &c.	Polawa.
Egg,	Muttei, &c.	Bijja.
Elephant,	Yanei, Kujaram, Varanam,	Atá.
Eye,	Kan, Vilzi, Net-theram,	Aha.
Father,	Tahappen, Pitha, Thathei, Thanthei, Piyá ; 'appá.	
Fire,	Neruppu, Thee, Kanali, &c.	Gini.
Fish,	Meen, Matcham,	Matsia.
Flower,	Poo, Putpam,	Mal.
Foot,	Kál, Pátham, Thál, Ade,	Paya.
Goat,	Adu, Velladu, &c.	Eluá.
Hair,	Mayir, Romam, &c.	Kes.
Hand,	Kai, Karam, At-tham,	Ata.
Head,	Thalei, Siram, &c.	Olua.
Hog,	Pandi, Súkaram,	Oorá.
Horn,	Kombu, Kódu,	Anga.
Horse,	Kutherei, Pari, Asuvam,	Aswaya.
House,	Vídu, Manei, Illam, Akam,	Geya.
Iron,	Irumbu,	Yakada.

<i>English.</i>	<i>Malabar.</i>	<i>Singalese.</i>
Leaf,	Ilei,	Kolé.
Light,	Velicham,	Eliya.
Man,	Manushen, Adaven, &c.	Minihá.
Monkey,	Kurangku, Manthi,	Wandara.
Moon,	Melavu, Chananderan,	Sanda.
Mother,	Thai, Matha, Annei Annei,	Amma.
Mountain,	Malei, Vetpu, Meru,	Kanda.
Mouth,	Vái,	Kata.
Moschito,	Vísei, Melvísei,	Madurua.
Name,	Pér, Namam,	Nama.
Night,	Iravu, Irattiri, Al,	Rae.
Oil,	Ennei, Thylam,	Tel.
Plantain,	Válei,	Kcsel.
River,	Yáru, Kangei,	Ganga.
Road,	Theru, Vithi, Valzi,	Pára.
Salt,	Uppu, Lavanam,	Lunu.
Skin,	Thól, Tholi,	Hama.
Sky,	Vánam,	Ahasa.
Snake,	Pámbu,	Sarpaya.
Star,	Natehettheram, Velli, &c.	Tarawa or tárakáwa
Stone,	Kallu,	Gala.
Sun,	Yeyil, Poluthu,	Sírya.
Tiger,	Puli, Vengei,	Wayággraya.
Tooth,	Pallu,	Datha.
Tree,	Maram,	Gaha.
Village,	Kurichi, Keramam,	Gama.
Water,	Thannír, Nír, Salam,	Watura.
Yam,	Kilangu,	Ala.
I,	Nán, Yán,	Mama.
Thou,	Ní, Nír,	Tó.
He, She, It,	Avan, Aval, Ah thu, or Athu,	Ohu, aé, éka.
We,	Nám, Nángal,	Api.
Ye,	Niugal,	Topi.
They,	Averkal, Avei,	Owun.
Mine,	Ennudeyathu, Enathu.	Magé.
Thine,	Ummudiathu, Umathu,	Togé.

<i>English.</i>	<i>Malabar.</i>	<i>Siagalese.</i>
His,	Avanudeyathu, Avarudeyathu,	Ohugé.
Our's,	Engaludeyathu, Emathu,	Apé.
Your's,	Ungaludeyathu, Umathu,	Topé.
Their's	Oné,	Owngé.
One,	Ondu, &c.	Ekay.
Two,	Irandu,	Dekay.
Three,	Múndu,	Tunai.
Four,	Nálu,	Hatarai.
Five,	Inthu,	Pahai.
Six,	Aru,	Hayai.
Seven,	Elu,	Hatai.
Eight,	Ettu,	Stai.
Nine,	Onpathu,	Nawayai.
Ten,	Pat-thu,	Dahayai.
Twenty,	Irupathu,	Wissai.
Thirty,	Muppathu,	Tihai or Tis
Forty,	Nátpathu,	Hatalehai.
Fifty,	Eympathu,	Panahai.
A hundred,	Núru,	Seya-yai.
Of,	In, Udeya, Thu,	Caret.
To,	Ku,	Tá.
From,	Al, Irunthu,	Gen.
By, instr.	Kondu, Al,	Wisin.
With, cum.	Udan, Odu, Idat-thu,	Samaga.
Without, sine.	Vittu, Allathu, Indi,	Natua.
In,	Il, Ul,	Atulé.
On,	Mél, Péril,	Pita.
Now,	Ippothu,	Dan.
Then,	Appothu,	Ewita.
When ?	Eppothu,	Kawadá.
To-day,	Indu, Indeikku,	Ada.
To-morrow,	Nálei,	Heta.
Yesterday,	Néttu,	Eeyé.
Here,	Ingá,	Mehé.
There,	Angéi,	Ehé.
Where ?	Engéi,	Kohéda.

<i>English.</i>	<i>Malabar.</i>	<i>Singalese.</i>
Above,	Méléi, Uyara,	Ihala.
Below,	Kéléi,	Pahala.
Between,	Udei, Idiyil,	Atare or mada.
Without, out- side,	Veliyé, Purambér,	Pita or bahara.
Within,	Ulléi,	Atulé.
Far,	Thúra,	Dura.
Near,	Kitte,	Langa.
Little,	Siru, Konjam,	Tika.
Much,	Met-tha,	Bohoma.
How much?	Evvalovu,	Koccharada.
As,	Pól, Ena,	Caret.
So,	Appadié, Avoannam,	Mesé.
Thus,	Ippadi, Avoethamaka,	Mesí.
How?	Eppadi, Evoethamaka,	Kohomada.
Why?	En, Ethukkuka,	Ayi.
Yes,	Ám, Om,	Ou.
No,	Alla, Illei,	Næ.
Do not,	Seyathéi,	Apá.
And also,	Um, Thanum,	Ta, da.
Or	Allathu,	Nohot.
His,	Avanudeya,	Óhirgey.
That,	Ah thu, Athu.	Eka.
Which, jón	} Thu, Carent,	Kókoda.
Which, tón		
Which, Kon	Ethu,	
What?	Enna, Entha,	Mokada.
Who?	Yár, Ever,	Kowda.
Anything,	Ethum,	Monawá numut.
Anybody,	Everayenum, Yarainum,	Kowru hari.
Eat,	Thin, Sappedu,	Kanawa.
Drink,	Kudi,	Bonawa.
Sleep,	Nel-thirei,	Nidá, gannawa.
Wake,	Villippu,	Nagitenawá.
Laugh,	Sirippu,	Hinahawenawa.
Weep,	Alukei,	Andanawa.

<i>English.</i>	<i>Malabar.</i>	<i>Singalese.</i>
Be silent,	Summayiru,	Katákaranda épá (i e. do not speak).
*Speak,	Pésu,	Katákarapan.
Come,	Vá,	Waren.
Go,	Po,	Palayan.
Stand up,	Nil,	Hitapan.
Sit down,	Iru,	Indagan.
Move, walk,	Nadamáduthal, Nadei,	Awidapan.
Run,	Oduthal,	Duapan.
Give,	Thá-Kodu,	Diyan.
Take,	Edu,	Ganin.
Strike,	Adi, Thattu,	Gahapan.
Kill,	Kollu,	Marapan.
Bring,	Konduvá,	Geneng.
Take away,	Eduttupódu,	
Lift up, raise,	Uyarthu, Thúkku,	Ussápan.
Hear,	Kél,	Ahapan.
Understand,	Vilangu,	Terunganin.
Tell, relate,	Sollu,	Kiyápan.
Good,	Nalla,	Honda.
Bad,	Akátha.	Naraka.
Cold,	Kufirmei,	Sítala.
Hot,	Súdu,	Usna.
Raw,	Pachei,	Amu.
Sweet,	Inippu,	Mihiri.
Sour,	Pulippu,	Ambul.
Bitter,	Kasappu.	Titta.
Handsome,	Alahu, Alahána,	Laksana.
Ugly,	Avalatchana,	Kata.
Straight,	Nére,	Kelin.
Crooked,	Kónal,	Aeda.
Black,	Karuppu,	Kalu.
White,	Venmei,	Sudu.
Red,	Sivantha,	Ratu.
Green,	Pachei,	Nil.

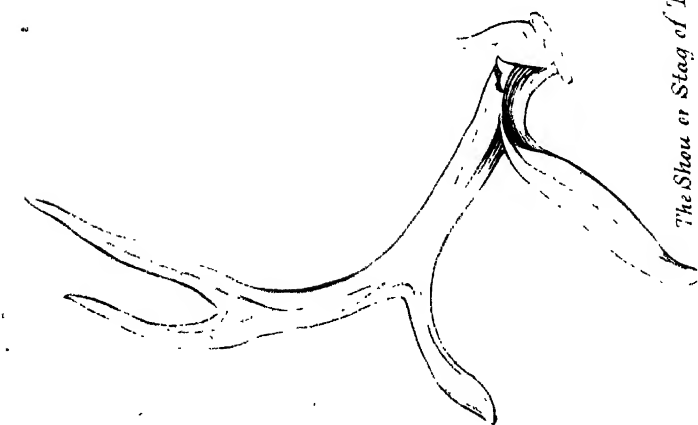
* These Singalese verbs are here put in the imperative mood.

<i>English.</i>	<i>Malabar.</i>	<i>Singalese.</i>
Long,	Nedia, Ninda,	Diga.
Short,	Kattei, Kurukal	
Tall	} man, Uyar nthavan,	Usa.
Short		Miti.
Small,	Siria, Sinna,	Punchi.
Great,	Peria,	Mahat.
Round,	Vattippu,	Wata or guli
Square,	Sathuramana,	Hataras.
Flat,	Shattei.	Patali.
Fat,	Kolut-tha, Thúlitha,	Tara.
Thin,	Melintha, Mellia,	Tuní.
Weariness,	Ileit-tha, Kalait-tha,	Wéhésa.
Thirst,	Thakam.	Pipása.
Hunger,	Pasi,	Badagini.

On the Shou or Tibetan Stag.—By B. H. HODGSON, Esq.

The subjoined sketch and measurements of a pair of stag's horns received from Tibet will doubtless excite much interest among Zoologists. I am indebted for the opportunity of examining these splendid spoils to my friend Dr. Campbell, Superintendent of Darjiling, who obtained them recently from a place called Ling-mo, not far from Phári, and situated in that arrondissement of the Tibetan province of Tsáng which is denominated Ding-cham by the Tibetans.

Ding-cham is the district extending north of Sikim and of Western Bhútán, from the ghát line of the Himálaya to the Kambalá or chain bounding the valley of the Yáru (Sanpoo) on the south. This district is described as being extremely rugged and bare, and no doubt is so, to a great extent, as forming part of the counter slope or pente septentrionale of such a chain as the Himálaya, and as having an elevation (just beyond the gháts, at least) of 16,000 feet, according to Dr. Hooker's determination. Yet Ding-cham is the habitat of a noble stag of the true Elaphoid type. Wherefore it is not too much to infer from this circumstance that within the bounds of that district, however



The Shou or Stag of Tibet. *Cervus affinis mhu*



Cervus Tibetanus.

rugged, there must be large tracts of comparatively level land ; and, as I have now obtained from various parts of Tibet two genuine Antelopes* with as many genuine Stags,† I conceive, that we may, nay should, generalize the above inference as to the physiognomy of the country, and conclude that Tibet with all its inequalities of surface is justly denominated, upon the whole, a plateau by Humboldt, notwithstanding all recent surmises to the contrary.

With these few prefatory remarks, I now proceed to describe the horns of the Shou or Stag, par excellence, of Tibet. These horns, which are a pair and in excellent preservation, are evidently the spoils of a mature and fine sample of the species. They are pale in colour, moderately pearly or rough on the surface, well bent in the beam, widely divergent, very ample in size, and genuinely Elaphoid in type. They are fifty-seven and a half inches in length along the curve, and nine and three quarter inches in thickness above the burr ; and they have the characteristic two basal and one central snags of the restricted group (*Elaphus*) very finely developed. The summit, however, consists of a deep fork merely, which is formed by one superior antler put off from the beam and not much inferior in size to it ; and, as the very same character distinguished the splendid sample of the supposed Stag of the Morung which was described many years ago by me in the Journal, I incline to think that this simply furcate summit is normal, nor ever replaced in increasing age by a many-antlered crown. The two basal snags are separated by an interval of about two inches. They are inserted obliquely on the outer and anteal aspect of the beam, and their general direction is horizontally forwards and outwards ; the lower one, however, having its point turned upwards, whilst the point of the upper one is curved downwards and backwards. The central snag is put off equidistantly from the basal and apical snags with an interval, from either, of about a foot. It starts wholly and clearly from the outside of the beam, and has an outward or lateral direction, at first horizontal, but curving boldly upwards from beyond the mid-length. It is smaller than the basal, or than the upper, snag, but ample in size. The upper snag is thick as the beam, but not so long ; is also put off from the outer side of the beam, but has a wholly

* *Pecticauda et Hodgsoni*, or *Góá* and *Chirú*.

† *Wallichii et Affinis*, or *Gyána* and *Shou*.

upward direction not greatly divaricating from the line of the beam,* and, like it, inclined forward towards the tip. The beams are well bent with a handsome backward slope as far as the central snag, beyond which they rise rapidly, but still keeping their graceful curve. The burrs are distinct but not large, and the points are sharp, save that of the upper basal snag which is blunt and worn, owing apparently to constant attrition with the earth caused by this snag's downward direction, and which must, I should imagine, have incommoded the living animal when grazing. These splendid horns have a great similarity of size, character and form to those of my *Cervus affinis*, the only differences noticeable between the two, being that the snags of the present subject are all put off from the beam somewhat more laterally (outside), and that the brow antlers consequently do not incline so directly over the face of the animal. The marked backward and downward curve of the upper basal antler or snag of the Shou towards its tip may be noted as a further subordinate distinction; but, upon the whole I conceive that the Shou is identical in species with my *Affinis*, and I am thence led to conjecture that my sample of the latter, though brought immediately from the Morung or Eastern Tarai, yet had priorly been carried there by some Tibetan trader or traveller, from whom it was obtained by some official of the Durbar of Nepaul. Certain it is, at all events, that the species does not now inhabit the Tarai, nor has done in the memory of the oldest inhabitant; and also, that the Durbar after much enquiry, at my suggestion, could only ascertain positively that the sample presented to me came to it from the Morung where it was believed to have been killed. With the Morung the Tibetans have much intercourse, and therefore I am led to infer that my first specimen may have come originally from Tibet, because the species still abounds there, and is not, now at least, found in any part of the Tarai. It is a noble animal, far superior in size to the Stag of Europe, and equal to the Wapiti or American exemplar of the genus. The Persian Stag and the Stag of Cashmere, not to add that of Mantchúria, are very possibly identical with our species, which in that event might be appropriately called the Asiatic Stag. Meanwhile, and pending the determination of these yet undescribed animals,

* In "crowned" horns this divergency is always great, both in the complete and incomplete states.

my specific name *Affinis* can stand as equally applicable to the supposed Morungian, and to the known Tibetan, animal; or, the Shou can be denominated *Tibetanus*, if considered distinct from the Morungian species, of which there is a fine sample in the British Museum.

I have already given my reasons for holding that the *Gyána* of Tibet or *Cervus Wallichii* is distinct from *Affinis*; and, as those reasons equally apply to the Shou, the distinctness of the latter from *Wallichii* of the same region, is thus established.

Dimensions of the horns.

	feet	in.
Greatest divergency of the tips between the upper snags,	3	7
Divergency between the ends of beams,	2	5½
Greatest length, along the curve,	4	9½
Girth, just above the burr,	0	9½
Chord of arc of beam, or greatest curve,	1	2½
Length of greater basal snag,	1	8½
Length of lesser basal snag,	1	5
Length of mid snag,	1	4
Length of upper snag,	1	8
Interval of basal and mid snags along the beam,	0	11½
Interval of mid and upper snag,	1	½
Weight of a single horn,	13	lbs.

On the Ghassánite Kings.—By A. SPRENGER, Esq., M. D.

Before the conquest of the followers of Mohammad there reigned a dynasty of kings in Arabia Petrea which is usually called the Ghassánite dynasty. They had come from Yaman and their tribe was related to the Khazrijites and Awsites, the tribes which occupied Madynah, to the Mázinites who are mentioned by Ptolemy and to some families of the Banú 'amr b. al-Azd, also to some of the Banú Aqá and to the banú Hárithah b. 'amr b. 'ámir.* All authors agree that the Ghassánites derived their name from the spring Ghassán which according to Mas'údy is in the valley of the al-Ash'arians (the Elisari of Ptolemy)

* Khoshaybary.

between Zabyd and Rima' *مع* : Pliny and Ptolemy place the Cassanitæ or Gasanitæ in the same spot. It would therefore appear that their original seats were in Yaman on the coast of the Red Sea. Arabic authors fable that the Ghassánites and the tribes related to them originally inhabited the city of Sabá which is mentioned by Mohammad in the Qorân probably on Jewish authority. There was a tank above the city, and a priestess foretold that rats or some other animals would perforate the dyke and that the city would be inundated. The inhabitants were so alarmed by this prediction that they emigrated. European critics have displayed an extraordinary amount of ingenuity in ascertaining what animal could have undermined the dyke! but none has for a moment doubted the truth of the fable.

The emigration of the Ghassánites from Yaman has probably taken place in the third century after Christ. This at least is the date of the immigration of the Khozá'ahites into Makkúh and of the Awsites and Khazrajites into Madynáh, and these three tribes migrated with the Ghassánites.

A generation in Arabia, as appears from the comparison of several hundred genealogies may be calculated at thirty lunar or twenty-nine solar years. The Ghassánite dynasty ceased 16 years after the Hijrah—A. D. 632. If therefore the Ghassánites had come to the throne of Arabia Petrea immediately after their migration, and if in all circumstances the eldest son had succeeded the father, we might suspect that there reigned from the time they emigrated from Yaman to the time when their dynasty ceased, that is to say, during a space of less than 400 years—about 13 kings; but it is certain that they did not at once conquer the country, and in oriental countries it seldom happens that the eldest son succeeds the father.

Hamzah of Ispahán, whom most other authors follow, gives us the following list of kings :—

1. 'Amr Mozayqiya.
2. Jafnah.
3. His son 'Amr.
4. His son Tha'labah.
5. His son al-Háarith.
6. His son Jabalah.
7. His son al-Iláarith called the son of Maria.

8. His son al-Mondzir the elder.
9. Al-No'mán son of N. 6.
10. Al-Mondzir son of N. 6.
11. Jabalah son of N. 6.
12. Ayham son of N. 6.
13. 'Amr son of N. 6. (Hamzah tells us that these six brothers have reigned together ninety-two years and eight months!)
14. Jafnah son of N. 7.
15. Al-No'mán son of N. 7.
16. Al-No'mán son of N. 12.
17. His son Jabalah.
18. Al-No'mán son of N. 11.
19. Al-Háarith son of N. 11.
20. His son al-No'mán.
21. His son al-Mondzir.
22. 'Amr son of N. 19.
23. Hojr son of N. 19.
24. His son al-Háarith.
25. His son Jabalah.
26. His son al-Háarith b. Aby Shmr.
27. His son Abú Karib al-No'mán Qatám.
28. Al-Ayham b. Jabalah, grandson of N. 25.
29. Al-Mondzir b. Jabalah, grandson of N. 25.
30. Sharáhyi b. Jabalah, grandson of N. 25.
31. 'Amr b. Jabalah, grandson of N. 29.
32. Jabalah b. al-Háarith b. Jabalah, great grandson of N. 25.
33. Jabalah b. al-Ayham, grandson of N. 10.

According to this list they would have reigned seventeen generations some of which (in cases, in which several brothers of the king succeeded him before his son) we should be obliged to calculate above the average duration : the dynasty could therefore not have lasted less than 520 years, and we would be obliged to place its beginning in the first century after Christ. Yet we know from Latin and Greek Historians that no such dynasty then reigned in Arabia Petrea.

Secondly, Hamzah himself allows that the last king was the grandson of the tenth, and this is confirmed by the *Kitáb alaghány* and all other

an-No'mán al-Hārith III. 'Amr, Abú Shimir the younger.

Hojr, an-No'mán, 'Amr, Al-Mondzir. al-Ayham.

1
Jabalāh last king who
had turned Moham-
madan but apostatiz-
ed under 'Omar.

Neither the list of Mas'ūdy nor that of Ibn Qotaybah is complete. The former author informs us that there were in all eleven kings and he enumerates only seven. The statement that there reigned in all eleven kings seems to be correct and if we put the three preceding lists together in such a manner as to make them agree with the incidental information which we find in other authors, we have eleven kings, viz.

'Amr

His origin is unknown according to Ibn Qotaybah p. 411. Mas'ūdy and Hamzah identify him erroneously with Mozayqiya.

Zayd	al-Hārith I. 1st King	Jafnah
	called <i>Moharriq</i> , and from him the whole dynasty is called <i>al Moharriq</i> (Ibn Qotaybah and Mas'ūdy). Hamzah places instead of him Jafnah and says he reigned 45 (lunar) years and 3 months.	(Mas'ūdy; Hamzah, Nos. 2 and 14) contemporary of Aswad King of Hyrah.
Zayd Manāt		'Amr I. 2nd King.
	mentioned only by Hamzah (No. 3) reigns 5 years. Built the convents of Hāly, Job and Hannād.	
Hind		Tha'labah, 3rd King.
mother of Mondzir Ming of Hyrah who was born about A. D. 400.	(Mas'ūdy and Hamzah No. 4.) Built 'Iqyah and the fortress of Ghadyr in the Hawrān not far from the Balqa. Reigned 17 years.	

Arqam	al-Hārith II. 4th King,
1	mentioned by Mas'ūdy who calls him erroneously Ibn Maria; and by Hamzah (Nos. 5 and 24) reigned twenty or twenty-six years. Was defeated by the Romans in 488. See Vincent, p. 248 note.

Maria	Abú Shimir, Jabalah I. 5th King,
d'zāt qortayn wife of Jabalah.	mentioned by Mas'ūdy and Hamzah (Nos. 6 and 25.) Built Qanṣtir, Adraj and Qastal. (Castellum?) Reigned 10 or 17 years.

al-Háarith III. 6th King.

called *al-A'raj*, *Ibn Aby Shimr* and *Ibn Maria*; the most distinguished King of the dynasty. Takes Khaybar; destroys the king of Hyrah al-Mondzir b. Má as-samá about A. D. 563. (*Ibn Qotaybah* p. 412, compare *Freytag Prov. Ar.* II p. 611). Hamzah mentions him under number 7 and 26. He reigned 21 years and 5 months. He is mentioned by Vincent in the *Periplus*, p. 248 note.

an-No'man

7th King.

Mas'údy and Hamzah (Nos. 9 and 27) reigned 15 years and six months.

al-Mondzir

8th King.

Mas'údy and Hamzah (Nos. 8, 10 and 30) reigned 13 years. He is called Mondzir the Elder.

Jabalalah

'Amr 9th King.

(Hamzah Nos. 13 and 32) reigned 10 years and 2 months. Mas'údy calls him 'Auf.

al-Háarith IV.

10th King.

A contemporary of No'man b. Mondzir of Hyrah. Hassán b. Thábit makes poems in his praise, (Mas'údy and Kitáb al-Aghamy and Hamzah).

al-Ayham

1

Jabalalah 11th and last King

was on the throne in A. H. 7 (Wáqidy and Ibn Ishaq).

Hassan b. Thábit made songs in his praise. Dethroned in A. D. 637.

Note on the bird-devouring habit of a species of Spider; by Capt.

W., S. SHERWILL. *Communicated by Mr. BLYTH.**

During one of my rambles in company with four other officers in the army, amongst the Karrakpur hills, in the immediate neighbourhood of Monghyr, on the Ganges, I fell in with several gigantic webs of a large black and red spider, which stretching across our path in many spots, offered from their great strength a sensible resistance when forcing our way through them. The webs are of a bright yellow colour, and we found them stretching from ten to twenty feet, that is, including the grey ropes which are generally fastened to some neighbouring tree or a clump of bambus, the reticulated portion being about five feet in diameter, in the centre of which the spider sits waiting for

* This interesting communication on the contested subject of bird-eating spiders originated in my request that the author would commit to paper the observation of which he had assured me in conversation.—E. B.

its prey; he is of a dark black hue with red about him, but at this distance of time, now three years, I cannot remember his exact appearance. I brought one down with me from the summit of the mountain Maruk, which is eleven hundred feet above the Ganges, and he measured six inches across the legs when set up. It was in the web of this very spider that I found the bird entangled, and the young spiders (about eight in number and entirely of a brick-red colour) feeding upon the carcass. The bird was much decomposed and enveloped in web, but the beak and feet being visible I sketched them, a copy of which sketch I enclose for your satisfaction.* The bird hung with his head downwards, his wings were closely pinioned to his sides by the entwined web, and was nearly in the centre of the web. The old spider which I secured was above the bird about a foot removed.

Had we not been a half-starved party, we should have bottled the bird, spider and young ones; but we were at the end of a five-days' roam amongst these steep hills, covered with wet grass, without beds or covering, in the height of the rainy season, so you may imagine our commissariat was at too low an ebb to afford brandy for such a purpose!

Note by Mr. Blyth. This communication from Capt. Sherwill is the more interesting, since the total demolition of Madam Merian's account of a bird-eating spider in Surinam, by Mr. W. S. McLeay, in the 'Proceedings of the Zoological Society,' 1834, p. The species would appear to be an *Epeira*, most probably undescribed, and remarkable for the "bright yellow colour" of its web.

*Note on an Inscription from Oujein; by RĀJENDRALĀL MITTRA,
Librarian, Asiatic Society.*

Sometime ago Mr. R. N. C. Hamilton of Indore presented to the Asiatic Society a fac-simile of a Grant discovered in digging a ruin in the vicinity of Oujein. The character of the Inscription is the Kutila of the 10th century, engraved on two tablets of copper the last of which has on it a figure of Gaḍuḍa, the vehicle of Viṣṇu. The style is extremely pompous and figurative, quite characteristic of the age in which it was written, and the document itself is imperfect as a

* A *Nectarinia* apparently, and probably *N. asiatica*.—E. B.

legal record, giving neither the boundary of the donation, nor the name of the country over which the donor exercised his authority. The fact, however, of a Hindu monarch granting the revenues of a village in the vicinity of Oujein, for the use of a goddess in that city, in the year 1036 Samvat, seems to throw some light on the course of succession of the Chohan kings of Malwa.

The catalogue recorded by Abul Fazl, (*Ayn Akbary*, Vol. II. p. 51,) places the whole of the Chohan dynasty, extending to about 140 years, between Jag-deva and Maldeva, the latter of whom, it is said, was dethroned in the year 866, A. C., by Sheikh Sháh, father of Alá-uddín. It is, however, stated by the same authority that Alá-uddín was a minor in the year 1037, thus making the reign of the Sheikh last for nearly 172 years!

The grant under consideration records a list of four kings, the last of whom lived 57 years before Alá-uddín, and bestowed a village in the vicinity of Oujein; if this circumstance would authorize the belief that he was a ruler of that country, the four kings named in the grant would fill up the hiatus between Maldeva and Sheikh Shah, and divide among themselves the greater part of the 172 years which Abul Fazi gives to the Sheikh alone.

It is difficult to determine if Vákpati-ráj, the last prince of the grant, was a scion of the noble house of the Chohans, or if Krishna-ráj Deva, the first on the list, was the immediate successor of Maldeva, and it is evident from the sanction of Rudráditya to the grant that Vákpati was not an independent sovereign, notwithstanding his ultra-regal title of *Mahárajádhirája*; the fact, however, of his authority in Oujein entitles him to a place in the blank between Maldeva and Sheikh Shah.

The names, arranged in the order of succession in connection with Abul Fazl's list, stand thus :—

Maldeva, 866, A. C. (A. F.'s list.)

Krishna-ráj Deva.

Vairisinha Deva.

Siyaka Deva.

Amoghaversa Deva, alias Vákpati-ráj Deva, alias

Vallabhanarendra Deva, 980, A. C.

Sheikh Shah, (A. F.'s list.)

Dharma Rājā Sand, Vizier during the minority of Alā-ud-dīn (1057), who put him to death.

Inscription.

याः कुन्दोदरभृद्विधानकमिलद्धूस्त्रप्रभाः प्रोक्षसन्मूर्द्धावज्जशशास्त्रको-
टिघटिता याः सैद्धिकेयोपमाः । याः कुक्षद्विरिजा कपोलशुचिता कस्तू-
रिकाविभ्रमास्ता ओकण्ठकठोरकण्ठरुचयः श्रेयांसि पुष्पान्तु वः ॥ बल-
क्षीवदनेन्दुना न सुखितं यन्नादितम् वारिधेर्वारा यन्न निजेन चात्मसरसा
पद्मेन श्रान्तिं गतम्यच्छेष्टा हि फणा सहस्रमधुरन्वासैर्न चाश्रासितं तद्रा-
धाविरहातुरं मुररिपोर्वेक्ष्यदपुः पातु वः ॥ परमभट्टारक महाराजा-
धिराज श्रीपरमेश्वर श्रीलक्ष्मणराजदेवपादान्तल्यात परमभट्टारक महा-
राजाधिराज श्रीपरमेश्वर श्रीवैरिसिंहदेवपादान्तल्यात परमभट्टारक
महाराजाधिराज श्रीपरमेश्वर श्रीसीयकदेवपादान्तल्यात परमभट्टारक
महाराजाधिराज श्रीपरमेश्वर श्रीमदमोघवर्षदेवाऽपराभिधान श्री-
मत्वाक्पतिराजदेव पृथ्वीवल्लभ श्रीवल्लभनरेन्द्रदेवकुण्डली ॥ तिखिस-
पद्रदादशकसंवत्समहासायनिक श्रीमहाइकभुक्तसेम्बलपुरकयामे समु-
पागतान् समस्तराजपु(र)धान् ब्राह्मणोत्तरान् प्रतिवासिपट्टकिलजन-
पदादींश्च बोधयन्तु वः । संविदितं यथायामोयमस्माभिः षट्त्रिंश-
साहस्रिकसंवत्सरेऽस्मिन् कार्तिकशुद्धपौर्णिमायां सोमग्रहणपूर्वणि
श्रीभगवत्पुरावासितैरस्माभिर्महासायनिक श्रीमहाइकपत्नो आसि-
नी प्रार्थनया उपरिलिखितयामखसीमान्था गयूतिगोचरपर्यन्तः
सहिरण्यावासभोगः सोपरिकरः सर्वादायसमेतः श्रीमदुज्जयिन्यां
भट्टारिका श्रीमत्सहदेवेश्वरीदेवैः स्नानालेपनपुष्पगन्धधूपदीपनैवेद्यप्रेक्ष-
णाकादिनिमित्ताय तथाखण्डस्फटिक(क)तटे च गृहे जगति समारच-
नार्थं मातापित्रोरात्मनः • स्वपुण्यशोऽभिरुद्धयेऽष्टफलैर्नामोस्तु-
चन्द्रार्काण्यवक्षितिसमकालं परया भक्त्या शासनेनोदकपूर्वकं प्रतिपादितं
च इति मत्वा तन्निवासिपट्टकिलजनपदैर्यथा दीयमानं भागभोगकरा

द्विरष्टादिकं सर्वमाश्चाश्ववद्विधेयैभूत्वा सर्वमस्याः समुपनेतव्यम् ।
 सामान्यं चैतत् पुण्यफलं बुद्धा ऽस्यवासिनैरन्यैरपि भाविभोक्तृभिरस-
 दारब्धधर्मादार्क्षायमनुमन्तव्यं पालनीयं च उक्तं च । बह्विर्बसुधा भु-
 क्ता राजभिः सगरादिभिः यस्य यस्य यदाभूमिस्तस्य तस्य तदा फलम् ॥
 यानोह दत्तानि पुरा नरेन्द्रैर्दानानि धर्मार्थयशस्कराणि । निर्मास्य
 वान्तप्रतिमानि तानि कोनाम साधुः पुनराददीत ॥ अस्मत्कुलक्रममुदा-
 रमुदाहरद्विरन्यैश्च दानमिदमभ्यनुमोदनीयम् । लक्ष्मीस्तडित्सलिल-
 वहुबुदवच्चलाया दानं फलं परयशः परिपालनञ्च ॥ सर्वानेतान्माविन
 पार्थिवेन्द्रान्भूयोभूयो याचते रामभद्रः । सामान्योयं धर्मसेतुर्दृष्टपाणां
 काले काले पालनीयो भवद्भिः ॥ इतिकमलदलाम्बुविन्दुलौलां श्रियःम
 नुचिन्त्यमनुष्यजीवितञ्च । सकलमिदमुदाहृतञ्च बुद्धा नहि पुरुषैः
 परकीर्त्तयो विज्ञेयाः ॥ इति संवत् १०३६ चैत्रवदि ६ पुण्य
 पुराविश्रतः श्रीमन्महाविजयंकरावारेख्यमाज्ञादायकश्रीरुद्रादित्यः ।
 स्वस्त्योयं श्रीवाक्पतिराजदेवस्य ॥

Translation.

May the musk spots on the elegant little cheeks of Girijá, resplen-
 dent as the gem *kunda* (1) shining in a cloud of evenenomed (2) smoke,
 beautiful as the strong neck of Srikantha, and comparable to Sainhika (3)
 (grasping) the ten millions of moons that are bound round the well-
 formed head (of Durgá);—may they preserve you in prosperity!

May the trembling body of Muráí, whom the charming countenance
 of Lakshmi delighteth not, and the waters of the ocean softeneth not;

1. One of the inestimable treasures of Kuvera, the god of wealth.

2. Lit. "smoke generated by the burning of poison."

3. "Son of Sainhika, a demon with the tail of a dragon, whose head was severed from his body by Vishnu, but being immortal, the head and tail retained their separate existence, and being transferred to the stellar sphere, became the authors of eclipses, the first especially, by endeavouring at various times to swallow the sun and the moon."—*Wilson*.

whom not even the beauty of his own excellent and lotus-like form can pacify, nor the breath of the thousand-hooded Sesha (4) appease;—of him who is frantic at his separation from Rádhá:—may it protect you!

The most venerable king of kings, lord Sri Krishnarája Deva was succeeded by the most venerable king of kings, lord Sri Vairisiñha Deva, whom succeeded the most venerable king of kings, lord Sri Siyaka Deva, who was followed by the most venerable king of kings, lord Sri Amoghavarsa Deva, alias Vákpati-rája Deva, beloved of the earth, Valabhanarendra Deva, the healthy.

* * * Be it known unto all the brahmanas, regal officers, and leaseholding neighbours assembled in the village of Sembhalapura, which holds * * * Sri Maháyika, that in the year of Samvat 1036, on the occasion of a lunar eclipse in the month of Kártika, we (of the city) of Bhagavatpura have, by this *edict* and water (5), at the request of Ásiní, the wife of * * * Sri Maháyika, for the promotion of the virtue and fame of ourselves and parents, presented to her this village, with an area of two coss beyond its boundary, together with all its buildings, commons, rents and taxes, for the period of the duration of the sun, moon, earth and ocean, (in order) to (defray the expenses of) bathing unguents, aromatics, flowers, incense, lights, edible articles, public exhibitions, &c. &c. (necessary for the worship) of the most venerable Haṭṭeswarí Déví of Ujjayini, and for decorating her crystal-paved temple. It is therefore the duty of the lease-holders of this place to pay to her the usual revenue, taxes, gold, &c. in obedience to her desires.

This pious act, begun by me, involving as it does the good of the public, my descendants and successors ought to observe and uphold:—for it is said; “By many kings, Sagara as well as others, the earth has been governed. Whosoever has been the land his has then been the fruit.

“The gifts which have been granted by former princes, conferring on

4. The king of the serpent race, as a large thousand-headed snake, at once the couch and canopy of Vishnu. *Wilson*.

5. i. e. the water made use of in the consecration of the grant.

them virtue, wealth and fame, resemble orts and vomited food. What good man will resume them ?" (6).

May they, who rehearse the munificence of my race, as well as those who do not, find this gift gratifying unto them ! and may they, knowing wealth to be as transient as lightning or like bubbles of water, uphold the bounty and fame of others !

Rāma the auspicious repeatedly beseecheth all the future rulers of the earth ever to preserve this public bridge of virtue for kings.

Wealth and life are as unstable as water on a lotus leaf, knowing this and the texts above quoted, men ought not to efface the glorious deeds of others.

The 9th day of the dark lunation of Chaitra, Samvat 1036.

* * * * By order of * * Sri Rudrāditya. Done by Sri Vākpati-rāja Deva.

PROCEEDINGS
OF THE
ASIATIC SOCIETY OF BENGAL

FOR JULY, 1850.

At a Meeting of the Society held on Wednesday, the 3d July, 1850,
The HON'BLE SIR JAMES COLVILLE, President, in the Chair.

The Proceedings of the last Meeting were read and confirmed.

The Secretary intimated that Mr. G. Udny had expressed his desire to withdraw from the Society on the expiration of the current quarter.

Read letters—

From N. O. Baillic, Esq., submitting for sale, a portrait of Sir William Jones, (said to be) by Sir Joshua Reynolds.

Ordered that the Picture be returned to the owner as the Society cannot purchase it.

From Rev. J. Long, forwarding a letter from Rev. G. G. Cuthbert, Secretary, Church Mission Society, regarding Mr. Long's application for 10 copies of the Bibliotheca Indica, for certain Vernacular Libraries established by that Mission, in different parts of Bengal.

Ordered that Mr. Long's request be complied with.

From Bábu Peáry Chand Mittra, Librarian, Calcutta Public Library, acknowledging the receipt of Nos. 25 to 29 of the Bibliotheca Indica, and No. 1 of the Journal for 1850.

From W. Seton Karr, Esq., Under Secretary to the Government of Bengal, the subjoined letter regarding the repairs of the Adinah Masjid.

No. 913.

*From the Under Secretary to the Government of Bengal.**To DR. W. B. O'SHAUGHNESSY, Vice President and Secretary to the Asiatic Society.**Dated Fort William, 11th June, 1850.*

SIR,—In continuation of the letter from this office, No. 457, dated the 2d April, I am directed by the Deputy Governor of Bengal to inform you that His Honour has been pleased, as a preliminary measure recommended by the Military Board, to sanction an outlay of Rs. 500, for the purpose of clearing the jungle round the Adinah Masjid of Panduāh.

2. The Officiating Executive Officer of the 4th Division having represented that elaborately carved pieces of Sculpture are constantly being carried away from the Masjid in question, the Superintendent of Police has this day been requested to instruct the Joint-Magistrate of Maldah, to endeavour, by all lawful means within his power, to prevent the spoliation of this monument of antiquity.

I have the honor to be, Sir,

Your most Obedient Servant, •

W. SETON KARR,

Under Secretary to the Government of Bengal.

From R. W. G. Frith, Esq., offering for sale a large collection of Insects from various parts of India.

Resolved—that the thanks of the Society be returned to Mr. Frith for his offer, and it be intimated to him that under the present state of their finances, the Society are unable to purchase the collection.

8. From Col. J. Low, Edinburgh, regarding the antiquities lately despatched by him from Penang.

Ordered that the Antiquities be returned to Col. Low's Agents in Calcutta.

9. From Dr. Roer, Secretary, Oriental Section, submitting certain Propositions of the Section, for adoption by the Society.

To Captain F. HAYES, Secretary, Asiatic Society.

SIR,—Dr. Ballentyne having offered a translation of the Sāhitya Darpana for publication in the Bibliotheca Indica, I have the honor, by direction of the Oriental Section, to request the sanction of the Society to his proposal.

The Sáhitya is a well known Sanscrit work on rhetoric, giving a view of the various kinds of composition in Sanscrit, and would be of great interest to the student of Sanscrit literature.

The Section also recommend the reprinting of the text. It has been published before by the Committee of Public Instruction, but is now out of print, and a new edition will be acceptable, and meet with a ready sale, as it is a text-book in the Government Sanscrit Colleges.

I forward the undermentioned Sanscrit books, which the Section propose to be purchased for the Library.

I have the honour to be, Sir,

Your most obedient Servant,

E. ROER,

Co-Secretary, Asiatic Society, Oriental Department.

Howrah, 1st July, 1850.

5 copies of Kádambari, 2d pt. at 2 Rs.,	10	0	0
1 copy of Dasa Kumára Charitā,	2	0	0
1 ditto Väiyákaraṇa Bhúshana,	1	0	0
1 ditto Sāṅkhya Tattvakaumudí,	1	0	0
<hr/>			
Co.'s Rs.....	14	0	0

To Captain F. HAYES, Secretary, Asiatic Society.

SIR,—By direction of the Oriental Section I have the honour to return the letters from Messrs. Lassen, Burnouf* and Müller, and to submit the suggestions of the Section thereon, for the approval of the Council and the Society.

2. With reference to Dr. Müller's letter the Section would propose,

1. That the Society should subscribe to 10 copies of each of the works intended to be printed by Dr. Goldstuecker, the cost to be charged to the Oriental Fund, as it has been done on a previous occasion concerning Dr. Weber's edition of the white Yajur Véda.

Those works are :

1. Jaimini's Púrva Mímánsá Súra.
2. Mádhava's Nyáya Málá Vistára.
3. Kumáрила's Tattva Várttika.

2. That Professor Brockhaus be presented with a copy of the Bibliotheca in return of his presentation of the Kathá-Sarit-Ságara to the Society.

* The letter from Professor Burnouf, I find, has not been returned to me.

3. With regard to Professor Lassen's complaint that the 14 numbers of the Bibliotheca and Dr. Hæberlin's Anthology have not reached him, the Librarian states, that he had despatched them last year along with other books per "Lord Auckland." The Section think it therefore advisable, that Messrs. Allen and Co. should be addressed on this subject, as well as on the cause of delay which appears to have taken place on several other occasions concerning the delivery of the books forwarded to them by the Society.

4. The Section recommend that those parts of the letters which refer to literary subjects be printed in the Proceedings.

I have the honour to be, Sir,

Your most obedient servant,

E. ROER,

Co-Secretary, Asiatic Society, Oriental Department.

Howrah, 1st July, 1850.

Extract from a letter of Professor CHR. LASSEN, dated the 3rd April, 1850.

MY DEAR SIR,—I received some days ago from Mr. Kœnig the 6th volume of Rájá Rádhiákánt Deb's Sabda-Kalpa-Druma and Dr. Hæberlin's Sanscrit Anthology. Of the 14 numbers of the Bibliotheca Indica, the box contained only those, bearing the address of Mr. Kœnig, while those which the Asiatic Society had intended to favour me with, were wanting. I cannot doubt that these books were despatched from Calcutta, and must therefore believe, the neglect lies with Allen and Co., to whom I will write immediately; but I am much afraid, that I shall not get the books. This is most vexatious to me, as I feel greatly disappointed by being deprived of this collection, of which I cannot expect the Society to spare another copy for me. How slowly, in general, books from India reach us, you will perceive from the fact that I have only now received the February number for 1849, of the Journal of the Asiatic Society, and of Mr. Hodgson's latest writings I have as yet seen nothing. You will much oblige me by thanking the Asiatic Society in my name for Dr. Hæberlin's Anthology, and Rájá Rádhiákánt Deb for the 6th volume of his Sabda-Kalpa-Druma.

I am very sorry to learn from your letter of the 8th January last, that neither the first part of the second volume of my Indian Antiquities, nor your diploma, together with the first numbers of the Journal of the German Oriental Society, has reached you. The former had last summer already arrived in London, as the Royal Asiatic Society acknowledged its receipt, and its non-arrival in Calcutta must likewise be ascribed to the neglect of the booksellers. I will in future despatch the books for Calcutta viâ Ham-

burg, and shall feel obliged, if you will do the same with the books, sent to me from Calcutta, under the address of J. Esmarch in Hamburg, who will safely forward them.

In the number of my Journal, now being under the press, I have given due praise to the publication of the Bibliotheca Indica by the Asiatic Society, and have also pointed out your share of merit in this undertaking. I am very glad to hear, that my proposition to publish the second part of the Naishadha has met with your approval.

I continue without intermission my work on Indian Antiquities. The printing of the next part will probably commence in the course of this year.

*Extract from a letter of DR. M. MÜLLER, dated Oxford, 20th
March, 1850.*

MY DEAR SIR,—You will have probably received before this, I hope, the first volume of my edition of the Rig Veda. It was ready in October last, and I had given orders to despatch the copies destined for India. Meanwhile I went to Germany, and on returning to England after five months, I found that the copies for India were despatched only a short time ago. I hope, however, that they have now safely arrived there, and that my edition will meet with the approval of the learned in India. On my return I was delighted to find the books which you so kindly sent me, viz. the Bibliotheca Indica, to number 2d (February, 1849), the Indian prints, and the 6th volume of Rājā Rādhākānt Deb's Sabda-Kalpa-Druma. Pray tender my best thanks to the Society and to the Rāja. I cordially thank you for your kindness, and congratulate you on your indefatigable efforts in publishing the Bibliotheca. The works you have selected are most excellent and useful. Should you be able to add also the Taittiriya Saṁhitā, you would satisfy all our wishes; but whatsoever you may give us, it is welcome to us here in Europe.

* * * * *

The labours in Sanscrit go on vigorously in Germany. Of Lassen's Indian Antiquities the first part of the second volume has only as yet appeared; soon, however, the second part will be ready. Bopp is engaged in writing a Comparative Essay on Accent. You will have probably received the fifth part of his Comparative Grammar. Weber is rapidly proceeding with his Vājasaneyi Saṁhitā. His Journal 'Indian Researches' contains likewise a good deal of interesting material. Stenzler's edition and translation of Yajñavalkya is very useful and correct. Bemsley is printing a Sanscrit Anthology, and Hæter has published a kind of Sanscrit spelling book. Great and important works are expected of Dr. Goldstuecker, especially his edition of

Jaimini's *Pūrva Mīmāṃsā Sūtras* with Śāvara's commentary, and Mādhava's *Nyāya Mālā Vistāra* perhaps also the *Tantra Vārttika* of Kumārila. These works are of the highest importance for the history and further elucidation of the doctrines of the Vedas, and much information may especially be derived from them concerning ceremonies.

Kumārila abounds with interesting details of Indian antiquity and the reviving critical knowledge of Indian philosophy which has exhausted its ingenuity in the Vedas. The difficulty in his undertaking is, as usual, the expense, no bookseller being disposed without a subscription to enter upon so great an undertaking. And still all these works are of the greatest importance for our oriental researches. Do you think, the undertaking would meet with any support in India? The printing of Mādhava's *Nyāya Mālā Vistāra*, of which interesting extracts are given in his introduction to the *Rig Veda*, will be immediately commenced, and the continuation of his labours will depend upon the success of this work. If the Asiatic Society would patronize the undertaking in the same way as they have done Dr. Weber's, a great service would be done to all of us. I saw Burnouf in Paris. He is engaged in completing the second volume of his *Buddhism*. I am sorry to say, his health is not as good as one would wish for the interests of science. Very great expectations are entertained of his history of southern Buddhism. Nothing else is doing in Paris for the Sanscrit, with the exception of Langlois' translation of the *Rig Veda*, of which the second volume is out already. Professor Wilson's translation of the same work has far advanced in printing. Here, in England, all oriental interest is concentrated in the decyphering of the Babylonian and Assyrian inscriptions by Major Rawlinson. He is now publishing the results of his labours, and is a man upon whom one can place reliance. Bournouf had likewise made many researches on this subject, but has given them up on discovering, that the language is Semitic, which is not his especial line of study. Many of the geographical names which Rawlinson now reads, had been discovered by Burnouf already two years ago, without, however, his publishing them. In Berlin the work of Professor Lepsius on Egypt, of which the first volume has appeared, creates great sensation. He is now occupied with a phonetic work which is to form the basis of a general system to represent by writing the sounds of Oriental languages, and the adoption of which would much advance Oriental science. We may come at last to an understanding on this subject, if each of us would agree to give up individual habits and customs. In India especially, I should think, the want of a systematic and general representation of Oriental words must be felt, and it would be a great thing, if after so many abortive attempts a general alphabet could be at last adopted. I will send you the work as soon

as it appears. Perhaps you may be able by your position, to contribute to its adoption by the Asiatic Society. This reminds me of Dr. Goldstuecker's desire of becoming a member of the Asiatic Society, and of receiving regularly a copy of the Journal as well as of the Bibliotheca. The subscription might best be paid to Allen and Co. I have the same wish for myself, but am afraid, the expense may be too much for me. Pray, inform me of the amount of the subscription, and whether it is not less expensive to subscribe to the Journal only, which I am anxious to receive regularly. Are there still to be had in India complete copies of the Asiatic Journal? and what is the price? Here we can only procure single numbers, and at a very high price. Nor are the Asiatic Researches anywhere for sale, and if you should find an opportunity of obtaining a complete set, I trust, you will think of me. Professor Brockhaus in Leipzig has charged me with the following commissions for you. He does not think fit under the present circumstances to go on with the publication of the Kathá-Sarit-Sāgara, and should feel delighted if you would complete this work in the Bibliotheca Indica. He is also very anxious to obtain a copy of the Bibliotheca. He has, some years ago, sent his edition of the abovementioned work to the Asiatic Society, but has never been informed of its arrival in Calcutta. With regard to the Rāmāyana which you once intended to publish, Gorresio has completed his edition of the text, and the Italian translation, notwithstanding the Sardinian discomfiture, is to be continued. On an early occasion I will send you £20 from the Royal Library at Berlin. Dr. Pertz, the Librarian, avails himself, with the sincerest thanks, of the permission of the Asiatic Society to have MSS. copied, and has fixed that sum for the commencement. No further part of the Nirukta by Roth has appeared, but a commentary has been promised. The Sanscrit philosophical books which you so kindly got for me, are very interesting, and ought to be translated. Is nothing done in India for the Yōga philosophy? which until now has been so undeservedly neglected. How is it with the Brihad Devatā of Souka? Is no MS. of it to be had in India? In Berlin there is one full of interesting matter, but too incorrect for publication. Likewise Saunaka's Chaturadhyāya and the Pratisākhya to the Atharva are rare MSS. which I should like to possess, if they are obtainable.

Excuse my troubling you with so many wishes. I fear, my letter has become a heap of requests and questions. I shall, however, be well satisfied without your replying to all of them, only let me hear soon again of what you are doing in India for Sanscrit literature.

Ordered that the recommendations of the Oriental Section be adopted, and Dr. Roer be requested to make any suggestion he may think fit with reference to the Society's Agents in London.

10. From R. Watson, Esq., forwarding a slab of flexible Sandstone, presented by Capt. Douglas.

11. From M. l'Abbé J. M. T. Guerin, presenting to the Society a copy of his work on Indian Astronomy.

After some desultory conversation regarding the Society's Museum of Economic Geology, it was moved by Rev. J. Long, seconded by Mr. Mitchell and resolved—

That the Council be requested to procure from Mr. Piddington, as Curator of the Museum of Economic Geology, a report of what he has done in that Department during the last twelve months.

The Librarian and the Zoological Curator having submitted their reports, the meeting adjourned.

Confirmed 3rd, August, 1850.

J. W. COLVILLE, *President*.

FLETCHER HAYES, *Secretary*.

*Report of the Curator Museum of Economic Geology for July, 1849.**

Geology and Mineralogy.—We have received from Captain Ommanney, Executive Engineer, 3d Division, a box of specimens, with a paper describing the site at which they were found, which may be thought worth printing in the Journal. From the description given I am inclined to suppose these stones form part of the ruins of some attempt at a *barrage* of a river for the purpose of irrigation, and that the wells described by Captain Ommanney are those belonging to an ancient subterranean water course, the *kan-naughts*† of the Persians, which are more or less known from Afghanistan and Persia to Constantinople, which city is still dependant upon them for much of its supplies of water.

Mr. Wm. Theobald, Junr. has sent us a miscellaneous collection of Indian and European rocks, minerals and fossils, out of which we shall be able to select a number of good ones, either as new varieties or duplicates, for our Cabinets.

* Having been mislaid, this Report was not published along with the proceedings for July, 1849.

† I do not know of any remains of them described in India, but it is difficult to suppose that the followers of the Mogul Emperors did not bring with them, and practice, the art of constructing these; and that, as here, the attempts often failed by the caprices of our Indian rivers.

Our old and zealous contributor Dr. Spilsbury sends us a large lump of the Magnetic Diorite described in my paper in the Journal for this year. He states also that the discoverer is Captain Jenkins, 10th Madras Infantry.

He mentions also a fine slab of Dendritic Sandstone but this is not yet received* though dispatched a year and a half ago!

He also presents a Hippopotamus' skull from the neighbourhood of Nursinghpoor, but minus the lower jaw; for which he is indebted, he says, to Mr. Cheyne, a Madras Medical Officer; and a portion of the lower jaw of an elephant of a kind totally unlike any of the preceding from the Nerbudda, and which he thinks resembles the *E. insignis* of Cautley and Falconer.

"It was dug up (he says) at Beltarree Ghat on the Nerbudda, a site from which I sent specimens years ago. Vide As. Jour. Aug. 1834, p. 389. These two specimens were sent in to Captain Elliot, the Deputy Commissioner of Nursinghpoor, and by him placed at my disposal."

Economic Geology.—I have put into the form of a paper for the Journal, my examination of an orange-coloured soil sent from Sikkim by Dr. Campbell, where it is used as a cure for Goitre.

Captain Campbell B. A., Commissary of Ordnance, Saugor, Bundelcund, has sent us a large collection of 128 specimens of rocks and ores, and of 44 specimens of clay of various kinds. These have not yet been examined.

Dr. Spilsbury has also procured for us from Dr. Macintire, Residency Surgeon, Nagpore, specimens of the various Samy stones (see Journal: Proceedings, Jan. 1845,) used in the polishing work of the arsenal there, as "Country Emery." The following is an extract from Dr. Macintire's chit sent by Dr. Spilsbury.

"By this day's banghy I send you a packet of small specimens of the different kinds of Samy stone procurable. I have numbered them 1, 2, 3, 3,

* 3, 4, 5, 6, so that you can select those you require. I can then send you any
* quantity.

The first five specimens are found in a quarry at a village named "Pohorah" about 60 miles to the right of the Raepore and Calcutta road. It is a regular "Koorrun" quarry, and these stones are taken from it to different parts of the country as an article of trade by Brinjarras and other people. They are found in strata as I have numbered them, i. e. No. 1, is under the surface, No. 2, under that again, and then come the different kinds of No. 3,

marked with the *. No. 3, is I believe found under all the others and there
* * *

was too much water in the quarry to see what was under it. All these are

* It has since arrived.

used in the arsenal here as "Samy stone" by the native Sicklegurs, and in addition to them they use 4, 5, and 6, none of which were found at Pohorah. I dare say however they are to be had there if a careful search could be made. The Commissariat supplies the arsenal with all these kinds under the name of "Country Emery." It is purchased in the bazaars, where it is brought by the Brinjarras, Beparries, &c. &c. No. 6 is called by the Madras Sicklegurs the real "Samy stone," because it will scratch or cut tempered steel. Next to it, in their estimation, comes ^{*}3, all the rest are good enough of ^{*}their kind and do well enough for cleaning brass work. Pohorah is situated in a hilly country. The only hill however known to contain these stones is the one in which the quarry is. Not far from it is a hill containing 'soap-stone' some of which the people brought to me."

So far Dr. Macintire's chit.—The stones however are of two different classes and have no relation to Major William's Samy stone which is an Agalmatolite, and rather used, it would seem, for burnishing. But in the eight specimens Dr. Macintire furnishes us with, are two new varieties for our cabinets, one of which is very remarkable; the specimens are as follows:

No. 1. Decomposing Fibrolite.

No. 2. Common white Corundum.

No. 3. Grey mottled Fibrolite.

No. 3. Mottled Corundum.

^{*}
No. 3. Black Corundum!
^{*}

Nos. 4 and 5. Common rose and lilac coloured Corundum.

No. 6. A very fine white Corundum.

The Black Corundum is a very remarkable variety, and though distinctly giving the re-action of the Corundums before the Blowpipe, i. e. the Sapphire blue glass with nitrate of cobalt, I have failed to detect iron or manganese in it. We must wait for a supply of it to know what the colouring principle is.

H. PIDDINGTON,

Curator, Museum Economic Geology.

Report of Curator, Zoological Department, for July Meeting, 1850.

SIR,—The donations which I have now to record consist of,

1. The skin of a young Assamese Goral, resembling that of an adult formerly received, and both differing from the ordinary Himálayan Goral in being of a bright rufous colour. Presented by Major Jenkins, of Gowhatti.

2. Thirty-five additional species of land and fresh water shells, from various parts of India, presented by myself.

I have the honour to be, Sir,
Obediently Your's,
E. BLYTH.

July 1st, 1850.

LIBRARY.

The following additions have been made to the Library since the June Meeting.

Presented.

Statistical Report of the district of Cawnpur; by Robert Montgomery, Esq. Calcutta 1849, 4to.—BY THE GOVERNMENT OF THE NORTH WESTERN PROVINCES.

A Dictionary, English and Panjābi, Outlines of Grammar, also Dialogues, English and Panjābi, with Grammar and Explanatory Notes, By Captain Starkey, 3rd Regiment, Sikh Local Infantry; Assisted by Bussowa Sing, Jemedar. Calcutta, 1849, 8vo.—BY THE GOVERNMENT OF INDIA.

Memoirs of the Royal Astronomical Society, Vol. XVIII. London 1850, 4to.—BY THE SOCIETY.

Monthly Notices of the Royal Astronomical Society, Vol. IX.—BY THE SOCIETY.

Astronomie Indienne l'apres la doctrine et les Livres Anciens et Modernes des Brammes sur l'Astronomie, l'Astrologie et la Chronologie suivie de l'Examen de l'Astronomie des Anciens peuples de l'Orient et de l'explication des principaux monuments Astronomico-Astrologiques de l'Egypte et de la Perse, Par M. L'Abbe J. M. F. Guerin. Paris 1847. 8vo.—BY THE AUTHOR.

The Calcutta Christian Observer, for July, 1850.—BY THE EDITOR.

The Oriental Baptist. No. 43.—BY THE EDITOR.

The Upadeshaka. No. 43.—BY THE EDITOR.

Tattvabodhini Patrikā. No. 83.—BY THE TATTVABODHINI' SABHA'.

Meteorological Register kept at the Surveyor General's Office, Calcutta, for the month of May, 1850.—BY THE DEPUTY SURVEYOR GENERAL.

Journal of the Indian Archipelago for April, 1850.—BY THE EDITOR.

Two copies of the same.—BY THE GOVERNMENT OF BENGAL.

Oriental Christian Spectator for May, 1850.—BY THE EDITOR.

Satyārṇava. No. 1.—BY THE REV. J. LONG.

Citizen. Nos. 1 and 5.—BY THE EDITOR.

Exchanged.

The Athenæum. Nos. 1173, and 1175 to 1177.

Purchased.

The Annals and Magazine of Natural History for April, 1850.

Kádambari, Vol. II. 5 copies.

Tattvakaumudi, 1 vol. 8vo.

Baiyákarāṇabhusana Sāra, 1 vol. 8vo.

Dasakumāra Charita, 1 vol. 8vo.

AUGUST 1850.

The usual monthly meeting was held on Wednesday, the 7th instant, at half-past 8 P. M.

The HON'BLE SIR JAMES W. COLVILLE, President, in the Chair.

The proceedings of the July meeting having been read and confirmed, the Secretary stated that Lieut. Stubbs and Mr. H. R. Alexander had intimated their desire to withdraw from the Society.

The following Gentlemen were named for ballot at the next meeting :

Rev. W. Smith—proposed by Rev. J. Long, and seconded by Capt. Smith.

Louis Stuart Jackson, Esq.—proposed by Mr. J. R. Colvin, and seconded by Henry Bogle, Esq. .

Read letters—

From J. Cassella, Esq., Consul General of H. M. King of Sardinia, forwarding a copy of a work entitled *Rapport sur les Etudes Chemin de fer de Chambéry à Turin*, presented to the Society by Professor Christofaro Negri, President of the University of Turin.

From Capt. Kittoe, relative to a communication regarding his researches into the ruins of Sárnáth, in Benares.

It was proposed by Mr. J. R. Colvin, seconded by Mr. Jackson and resolved—

That the substance of Capt. Kittoe's letter be forwarded to the Secretary to Government, North-Western Provinces, with an expression of the Society's sense of the interest that attaches to any Research into the antiquities of Sárnáth, and of its hope that the Government of the North-Western Provinces will be pleased to give such assistance as may be in its power, to the prosecution of Capt. Kittoe's enquiries.

From F. L. Beaufort, Esq., forwarding some bricks with Arabic inscriptions, from an old building near Jessore.

From Joseph Power, Esq. Principal Librarian, University Library, Cambridge, communicating the thanks of the University for a copy of the Sanscrita Anthology and the first 14 Nos. of the Bibliotheca Indica, presented to it by the Society, and requesting to be supplied with the continuation of the last named work.

Communications were received—

From G. Buist, Esq., Bombay, on the Encrustations of Steam Boilers and Pipes in India.

Ordered for publication in the Journal.

From Major J. Hannyngton, Chota Nagpur, Tables of Mortality according to the experience of the Bengal Civil Service, with values of annuities, assurance, &c.

From Mr. Blyth, Remarks on the modes of variation of nearly affined Species or Races of Birds chiefly inhabitants of India. Ordered to be printed in the Journal.

From Dr. Roer, Secretary, Oriental Section, submitting a report of the Section respecting Dr. Wise's History of Tipperah. After some discussion, Mr. J. R. Colvin proposed—That the Secretary communicate with Dr. Wise to ascertain his authority for receiving the History transmitted by him, as a History which the Rájás of Tipperah themselves consider to be an authentic record of the origin of their family, and of the succession of Rulers of the Tipperah Ráj.

The motion having been seconded by Mr. Mitchell, was carried.

It was further proposed by Mr. Jackson, seconded by Dr. Roer, and resolved—that the Bengali Chronicle of the Rájás of Tipperah be made over to the Rev. J. Long, with a request that he will re-examine it, and submit to the Oriental Section such parts or notices of it as he may consider of such historical or other value as to be deserving of publication.

From the same, suggesting, in reply to a reference from the Society, that a copy of the Bibliotheca Indica be presented to each of the following institutions, namely,

University of London.

_____ Edinburgh.

_____ Utretcht.

_____ Leyden.

_____ Berlin.

_____ Bonn.

American Oriental Society.

Asiatic Society of Ceylon.

_____ of Hong Kong.

For all the above communications and donations, the thanks of the Society were voted, and the meeting adjourned.

Confirmed 4th September, 1850.

Signed { W. JACKSON, *Vice-President*.
F. HAYES, *Secretary*.

Report of the Curator, Zoological Department, for August Meeting, 1850.

To the Secretary of the Asiatic Society.

SIR,—I have only on this occasion to report the arrival of a large box of skins of mammalia and birds collected in the Kandian territories by Dr. Kelaart, of the Ceylon Medical Service. They are sent to me privately for comment, with permission to present certain specimens to the Society; and I propose to draw up a paper of descriptions of some of them for publication in the Society's Journal.

I have the honour to be, Sir,

Your's obediently,

E. BLYTH.

Asiatic Society's Room, Aug. 30, 1850.

LIBRARY.

The following additions have been made to the Library since the last meeting.

Presented.

Rapport sur les Etudes du Chemin de fer de Chambéry à Turin, et de la Machine proposée pour exécuter le Tunnel des Alpes entre Modane et Bardonnèche par M. le Chevalier Henri Maus: et Rapport rédigé au nom de la Commission chargée de l'examen de ces études par M. le Chevalier Pierre Paleocapa, Turin 1850. fol.—PRESENTED BY M. CHRISTOFARO NEGRI.

Report of the Revenue Administration of the Lower Provinces, for 1847-8, (fol. Pamphlet).—BY THE GOVERNMENT OF BENGAL.

Futtehgur-Nameh, by Halay Rae, Deputy Collector. (Urdu).—PRESENTED BY SIR HENRY ELLIOT, KT.

Report by the Secretary, on the Proceedings of the Bombay Geographical Society for 1849-50.—BY G. BUIST, Esq.

A few Remarks on certain Draft Acts of the Government of India, commonly called the "Black Acts." By Ram Gopaul Ghose. Calcutta 1850, 8vo. pamphlet.—BY BĀBU RA'JENDRALĀ'L MITTRA.

A Letter to J. C. Melvill, Esq., Secretary to the East India Company, on the Grand Exhibition of Art to be held in London, in 1851, as connected with the manufactures and raw produce of India. By J. Tailor, Esq. 1850, 8vo. pamphlet.—BY THE AUTHOR.

Journal of the Indian Archipelago, for May, June and July 1850.—By THE EDITOR.

The Oriental Baptist, No. 44.—By THE EDITOR.

The Calcutta Christian Observer, for Aug. 1850.—By THE EDITORS.

Upadeshaka, No. 44.—By THE EDITOR.

Tattvabodhini Patrikā. No. 84.—By THE TATTVABODHINI' SABHA'.

Annual Report of the Tattvabodhini Sabhā, for the Bengali year 1771.—By THE SAME.

The Oriental Christian Spectator, for June 1850.—By THE EDITOR.

Meteorological Register kept at the Surveyor General's office, Calcutta, for the month of June 1850.—By THE DEPUTY SURVEYOR GENERAL.

Purchased.

Comptes Rendus. Nos. 12 @ 20 of 1850.

Journal des Savants for January, February and March 1850.

Annals and Magazine of Natural History, for June 1850.

SEPTEMBER 1850.

At a meeting of the Asiatic Society held on the 4th instant—

WELBY JACKSON, Esq. Vice-President, in the Chair.

The Proceedings of the preceding meeting were read and confirmed.

The following gentlemen, having been duly proposed and seconded at the last meeting, were balloted for and elected Members.

Rev. W. Smith.

L. S. Jackson, Esq.

Notes were recorded from Dr. Macrae and Rev. S. Slater, withdrawing from the Society.

Read a letter from W. Jackson, Esq. presenting a copy of a work on the Statistics of Agra, by C. C. Jackson, Esq.

The Secretary submitted an application from Mr. H. Roberts, Assistant to the Zoological Curator, soliciting an increase of Salary, also a note from the Council, stating that under the present state of the Society's Funds, they do not think themselves justified in recommending any increase of Salary to Mr. Roberts.

The Librarian and Zoological Curator having submitted their usual monthly reports, the meeting adjourned.

Confirmed, *2nd October, 1850.*

WELBY JACKSON, *Vice-President.*

FLETCHER HAYES, *Secretary.*

Report of the Curator, Zoological Department, for August, 1850.

SIR,—My present Report records the presentation of the following donations.

1. Bábu Rájendra Mallika—A dead Lemur, the skin and skeleton of which have been prepared.

2. Rájá Pertáb Chand Singh—A recent specimen of a Shark.

3. Capt. Berdmore, Madras Artillery, Moulmein. A collection of skins chiefly procured at Mergui. Among them is that of a Squirrel which does not exactly tally with any previously examined. In the bird class, it adds a very beautiful Malayan Owl, *Syrnium seloputo*, (Horsfield,) to the Society's collection; and there are specimens of the young of *Sturnia sinensis*, a species stated by Mr. Lesson to inhabit the Malayan peninsula and Cochin China as well as China. Also specimens of *Argus giganteus* and *Euplocomus ignitus*, neither of which magnificent *Gallinacæ* had previously been observed so far

to the north.* And Capt. Berdmore has sent examples of *Collocalia* (the edible-nest building Swiftlets) from the Mergui Archipelago, both skins and examples in spirit, with the nests and eggs, the former old and of inferior quality. The species resembles *C. brevirostris*, (McClelland,) but is larger than I had previously seen. I may further remark that I am indebted to Capt. Berdmore for some living specimens of the new Duck described in *J. A. S.* XVIII, p. 820, by the name *Sarcidiornis ? leucopterus* ; but it proves to be a typical species of *Casarca*.

I have the honour to be, Sir,

Your's obediently,

E. BLYTH.

LIBRARY.

The following books have been received since the last meeting.

Presented.

The Report of the British Association for the advancement of Science, for 1849.—PRESENTED BY THE ASSOCIATION.

Statistics of Agra ; by C. C. Jackson, Esq.—PRESENTED BY W. JACKSON, Esq.

The Calcutta Christian Observer, for September 1850.—BY THE EDITORS.

The Oriental Baptist, for September 1850.—BY THE EDITOR.

The Oriental Christian Spectator, for July 1850.—BY THE EDITORS.

Upadeshaka. No. 45.—BY THE EDITOR.

Journal of the Indian Archipelago, for May and June 1850, 2 copies.—BY THE GOVERNMENT OF BENGAL.

Meteorological Register kept at the Surveyor General's office, Calcutta, for the month of July, 1850.—BY THE DEPUTY SURVEYOR GENERAL.

The Tattvabodhini Patrikâ. No. 85.—BY THE TATTVABODHINI'SABHA'.

Rájabyabasthá, or a Bengali Translation of Mr. Beaufort's Digest of the Criminal Law of Bengal. By Hemachandra Mukarjya of Janâi.—BY THE TRANSLATOR.

Exchanged.

The Athenæum. No. 1120.

Purchased.

Bopp's Comparative Grammar, Vol. III.

Wallace's Memoirs of India.

Flügel's German Dictionary.

Edinburgh Review, No. 182.

Annals and Magazine of Natural History, No. 31.

Comptes Rendus, Nos. 21 @ 25, for June 1850.

Journal des Savants, for May and June.

* Hardwicke erroneously states that *A. giganteus* inhabits Sylhet. Vide MS. in British Museum.

[Meteorological Register, continued.]

[illegible]

JOURNAL
OF THE
ASIATIC SOCIETY.

No. VII.—1850.

Conspectus of the Ornithology of India, Burma, and the Malayan Peninsula, inclusive of Sindh, Asúm, Ceylon, and the Nicobar islands.—By E. BLYTH, Esq.*

Fam. VULTURIDÆ.†

Gidh, H. : *Shukuni*, Beng. : *Gid*, or *Gerni*
(Tickell).

Subfam. VULTURINÆ.

Genus VULTUR, L. (as restricted).

72. V. MONACHUS, L. (Edwards, pl. 290 ; Tem., *Pl. Col.* 426 ;
Gould's *B. E.* pl. 2).

SYN. *V. cinereus* et *V. cristatus*, Gmelin.

V. arrianus, Lapeyr.

V. imperialis, Temminck.

V. vulgaris, Daudin.

V. niger, Brehm.

Ægyptius niger, Savigny.

HAB. Mountainous parts of Europe and Asia ; Himalaya.

* Continued from p. 342.

† The restricted VULTURIDÆ divide into

1. VULTURINÆ. Comprising the genera *Vultur* and *Otogyps*.

2. GYPINÆ. *Gyps* and *Gyphierax*.

3. SARCORHAMPHINÆ. *Sarcorhamphus*, *Cathartes*, and *Neophron*.

Genus OTOGYPS, G. R. Gray.

73. O. CALVUS (Tem., Pl. Col. 2).

SYN. *Vultur calvus*, Scopoli.

V. ponticerianus, Daudin.

Mollá Gidh ('Priest Vulture'), H: *Lál-mátá Shukuni*
('Red-headed Vulture'), Beng.

HAB. India generally: common. Tenasserim provinces.

Subfam. GYPINÆ.

Genus GYPS, Savigny.

74. G. FULVUS (Pl. Enl. 426).

SYN. *Vultur fulvus*, Gmelin.

V. persicus, Pallas.

V. vulgaris et *V. percnopterus*, Daudin.

V. albicollis, Linderen.

V. trincalos, Bechstein.

V. indicus apud Jerdon, *Catal.*

V. Kolbei (?), Daudin.

Gyps vulgaris, Savigny.

Mahá deo ('huge giant'), of Mahrattas?

HAB. Mountainous regions of the Old World: Himalaya; not well ascertained as an inhabitant of S. India.

Remark. Ornithologists are much divided in opinion as to whether at least two distinct, though closely affined, species exist in *G. fulvus* and *G. Kolbei* of authors. Dr. A. Smith regards them as the same, as does also Mr. G. R. Gray (in his second and improved edition of the Catalogue of *Raptores* in the British Museum (1848). Still more recently, M. Degland also identifies them, remarking that—"Le *Chasse-fiente* de Levaillant, et le *V. Kolbei* que M. Temminck lui rapporte, mais que le Docteur Rüppell regarde comme une espèce parfaitement distincte, me paraissent appartenir l'une et l'autre au *V. fulvus*;"—the various figures referred to by different authors, according to this naturalist, representing one and the same species in different phases of plumage. On the other hand, M. Alfred Malherbe, in his *Faune Ornithologique de la Sicilie*, p. 20, refers to *G. fulvus* and *G. Kolbei* as "espèces parfaitement distinctes (ainsi que l'on peut s'en convaincre en examinant les nombreux sujets donnés au muséum

de Franckfort-sur-Mein, par M. le Docteur Rüppell);”* and M. Temminck gives their differences as follows, admitting both into the European fauna. The *Chasse-fiente* (*G. Kolbei*), according to this naturalist, may be distinguished at all ages from the true *Vautour Griffon* (*G. fulvus*) by the shape of the feathers on the wings and under-parts, all of which are rounded at tip, whereas in the *Griffon* the same feathers are long and acuminate; the ruff also is not so long nor so abundant. General colour of the plumage of *G. Kolbei* pale *café-au-lait* or isabelline, often (or according to age) varied or margined with brown more or less deep. The adult is almost wholly of a whitish isabelline; whereas the plumage of the adult *Griffon* is light brown throughout. The crop of the *Chasse-fiente* is of a deep brown, the head and neck covered with close flat down. A fine adult in the Society’s museum from Algeria (received from M. Mallherbe) accords with this description of the *Chasse-fiente*; while a young bird from Nepal (in much worn plumage) seems to correspond with the *Griffon*. Dr. Schlegel classes the *Chasse-fiente* as a permanent variety of *G. fulvus*, terming it *Vultur fulvus occidentalis*.

Lastly, Mr. John Cassin, in his notes on the *Vulturidae* in the collection of the Academy of Natural Sciences of Philadelphia (published in the ‘Proceedings’ of that Academy for 1849, p. 158), remarks finally on the question as to the plurality of species confounded under *G. fulvus*, that—“In the present case the number of specimens” (16!) “is not sufficiently large to warrant a conclusion, but they appear to present uniformly different characters enough to induce the opinion that the following are specifically distinct;—*Gyps fulvus*, (Gm.); *G. Kolbei* (Daud.); *G. indicus*, (Tem.); and *G. tenuirostris*, (Hodgson);” though he afterwards expresses a doubt with regard to the correct identification of the last, and believes the *G. indicus*, (Tem.), to be from Africa! Mr. Jerdon, however, considers that M. Temminck’s plate of his *Vultur indicus* represents the young of *G. bengalensis*, (Gmelin).

75. *G. INDICUS* (Gray and Mitchell, *Ill. Gen. Birds*, pl. 3).

SYN. *Vultur indicus*, Scopoli and Latham.

* Dr. Rüppell himself, however, now considers them to be the same. Vide his *Systematische uebersicht der Vögel Nord-ost Africa’s* &c. (1845), p. 9.

V. tenuiceps et tenuirostris, Hodgson.

HAB. India and Malay countries.

Remark. This is the only Vulture which we have seen from the Malayan peninsula, and it appears to be common in open country throughout India, never (that we have observed) coming into towns or populous neighbourhoods. Like *G. fulvus*, it has 14 tail-feathers, *G. bengalensis* having constantly but 12;* and it is remarkable for the elongation of the ceral portion of the bill, and narrow form of the head, as compared with *G. bengalensis*; the bill and head of *G. fulvus* being intermediate. Its plumage much resembles that of *G. fulvus*; but old birds have merely a few small scattered downy tufts on the black naked neck. The original description of this species by Sonnerat refers to an individual of the second year.

76. *G. BENGALENSIS* (Hardwicke's *Ill. Ind. Zool.*).SYN. *Vultur bengalensis*, Gmelin (the young).*V. indicus*, Tem. (young, apud Jerdon in *epistola*).

<i>V. chagoun</i> , Daudin	} adult.
<i>V. leuconotus</i> , Gray	

HAB. India generally: Tenasserim provinces. A summer visitant in Afghanistan. Very abundant in populous neighbourhoods, about the outskirts of towns and villages, and occasionally even alighting in the streets, shewing little fear or distrust of the passers-by.† In the open country it is replaced by the preceding species. According to Rüppell, *G. bengalensis* also inhabits Sennaar.

Subfam. SARCORHAMPHINÆ.

Genus NEOPHRON, Savigny.

77. *N. PERCNOPTERUS* (Pl. Enl. 407, 429).SYN. *Vultur percnopterus*, L. (nec Pallas).*V. leucocephalus* et *V. fuscus*, Gmelin.

* From the Parrots and Birds of prey until we come to certain Pigeons, there is no other instance of the number of tail-feathers exceeding twelve.

† On one occasion, when a number of these Vultures had descended in the Society's compound at sight of some flesh, I observed a particularly fine adult, which I directed an attendant to entice by throwing to it morsels of meat nearer and nearer, when it was taken without difficulty by the hand. On seizing it by the wing, the Vulture struggled to escape, but made no attempt at defence. Its companions,

V. ginginianus et *V. albus*, Daudin.

V. meleagris, Pallas.

V. fuscus, Boddaërt.

V. leucocephalus, Brisson.

Pernopterus ægyptiacus, Stephens.

Sūgra, or *Sūndh*, ('sharp-scented,') Sindh (Burnes).

HAB. Warmer regions of Europe, Asia, and Africa: abundant on the plains of India; rare and accidental below the tideway of the rivers in Lower Bengal. A summer visitant in Afghanistan.

Fam. GYPÆTIDÆ.

Genus GYPÆTOS, Storr.

78. *G. HEMACHALANUS*, Hutton, *J. A. S.* III, 522.

G. barbatus orientalis (?), Schlegel and Pr. Bonap.

- *Ūrgūl*, Masuri (Hutton): *Kajir*, or *Fumai*, Kabul (Burnes). *Golden Eagle* of English residents in the Himalaya. †

HAB. Himalaya; Afghanistan.

Remark. There appear to be three closely affined species or races of Lammérgeyers, namely *G. barbatus* of the Alps and higher mountains of S. E. Europe and probably Asia Minor,—*G. meridionalis*, Brehm, of N. Africa and found also on the Pyrenees and in Sardinia,—and the present Asiatic race distinguished by a pectoral band, in general conspicuously developed, and which would appear never to occur in the others. *G. meridionalis* is recognized as a permanent variety of *G. barbatus* by Dr. Schlegel, equivalent to his distinction of *Circus Sykesii* from *Circus cinerascens*; but M. Degland regards it as insufficiently distinguished, it being merely of inferior dimensions and less robust.

however, immediately took the alarm, but without going away, and would not be enticed near enough to allow of a second capture. It is remarkable that during some years these Vultures come much more into the town of Calcutta than in other years; for, in general, they are little seen except about the abattoirs and place of cremation.

Tribe. NOCTURNÆ.*

Fam. STRIGIDÆ.†

Hulu, *Jaghal*, and *Būm* (Pers.), *H.*; *Hūtūm*, and *Pencha*, *B.*; *Bassá*, Cingh.

Subfam. BUBONINÆ.

Genus BUBO, Sibbald.‡

79. B. ORIENTALIS (Pl. Col. 174, 229).

SYN. *Strix orientalis*, Horsfield.

S. sumatrana, Raffles.

S. strepitans, Temminck.

B. et Huhua nipalensis, Hodgson.

H. pectoralis, Jerdon.§

Huhua and *Huhu chil*, ('Howler'?, or 'Howling Kite'?),

Nepal (Hodgson): *Ūman*, Malabar (Jerdon).

HAB. S. E. Himalaya; S. India; and Malay countries.

80. B. BENGALENSIS (Gould's 'Century,' pl. 3).

SYN. *Otus bengalensis*, Franklin.

Bubo caveareus et *Urrua cavearea*, Hodgson.

Ghughu, II. (Jerdon).||

HAB. India generally; Afghanistan: but not met with below the tideway of the rivers in Lower Bengal.

* Vide p. 317.

† The Owl family primarily divides into three subfamilies, viz.:—

1. BUBONINÆ. Comprising all the species with *aigrettes*, or the 'Horned Owls,' inclusive of *Nyctea* which has distinct though small *aigrettes*.

2. SURNINÆ. *Athene*, *Syrnium*, and their numerous (and chiefly intermediate) affines.

3. STRIGINÆ. *Phodilus*, *Strix* (as now limited), and *Glaux*.

‡ We have been assured of the existence of *BUBO MAXIMUS*, Sibbald, in the Himalaya, in addition to *B. bengalensis*, *Ketupa flavipes*, &c., but have seen no specimen. Mr. Gould has seen it from China.

§ *Bubo pectoralis*, (Jerdon), from the Himalaya, is given as a distinct species from *B. orientalis* (v. *nipalensis*) from Java, in Mr. John Cassin's Catalogue of the *Strigidae* in the collection of the Academy of Natural Sciences of Philadelphia (1849).

|| In Bengal, this name is applied to the Doves (*Turtur*). In either case, it derives evidently from the voice. So, also, *Hulu*, II., *Ulula*, latin (whence *Ulu-lo*), and *Owl* (and *howl*), English, &c. Again, *Ūlū*, II., *Ūlūk*, Beng., for the *Hylobates hoolock*.

81. **B. COROMANDER** (Hardw. *Ill. Ind. Zool.*,—very bad).

SYN. *Strix coromandra*, Latham.

Urrua umbrata, Blyth.

HAB. India generally.

Genus ASIO, Brisson.

82. **A. OTUS** (*Pl. Enl.* 29 ; Gould's *B. E.* pl. 39).

SYN. *Strix otus*, L.

S. soloniensis, Gmelin.

S. diminuta, Pallas.

Otus albicollis, Daudin.

O. europæus, Stephens.

O. communis, Lesson.

O. vulgaris, Fleming.

O. sylvestris, *arboreus*, et *gracilis*, Brehm.

O. Wilsonianus, Lesson. } American.

O. americanus, Bonap. }

HAB. Europe and N. Asia ; Himalaya ; N. Africa ; N. America ?

Remark. The N. American race, regarded as distinct by some authors, is considered by Mr. G. R. Gray to be identical with that of the Old World. Vide Brit. Mus. Catalogue of *Raptores* (1848).

83. **O. BRACHYOTUS** (*Pl. Enl.* 438 ; Gould's *B. E.* pl. 40).

SYN. *Strix brachyotus*, L.

S. ulula, *ægolius*, et *accipitrina*, Pallas.

S. arctica, Sparrman.

S. tripennis, Schrank.

S. palustris, Smies.

S. caspia, Shaw.

S. brachyura, Nilsson.

Otus palustris et *agrarius*, Brehm.

Chotû Ghughu (' small Owl'), II. (Jerdon).

HAB. Europe, Asia, Africa, and N. and S. America. India generally, visiting the plains in winter.

Genus SCOPS, Savigny.

84. **SC. ALDROVANDI**, Ray (Gould's *B. E.* pl. 41 ; Jerdon's *Ill. Ind. Orn.* pl. 41, chesnut variety).

SYN. *Strix scops*, L.

S. zorca et *giu*, Scopoli.

S. pulchella, Pallas.

S. carniolica, Gmelin.

S. ephialtes, Savigny.

S. lakhamana (?), Pennant.

Scops europæus, Lesson.

Sc. senegalensis, Swainson.

Sc. capensis, Smith.

Sc. sunia (chesnut variety), and *Sc. pennata* (grey variety),
Hodgson.

Sc. malayanus, A. Hay.

Sc. rutilus, Pucheran, *Rev. Zool. &c.*, 1849, p. 299.

Ephialtes spilocephalus (?), Blyth, the young?

Otus (Scops) japonicus, et *O. (Sc.) africanus*, Tem. (apud
G. R. Gray).

Chitta gul ('small Owl'?), Telinga (Jerdon): *Chugad kusial*, or
Sunya kusial, Nepal (Hodgson).

IIAB. Europe, Asia, and Africa: in Europe migratory.

Remark. In India, Burma, &c., this species assumes a phase of plumage very commonly, which does not appear to have been ever observed in Europe, and in Africa but rarely;* though frequent also in *Sc. asio* of N. America, and a similar variation (though to a less extent) occurs likewise in *Syrnium aluco*, as well as in some of the *Podargi*. It is characteristic neither of age nor sex. The phase referred to is a bright chesnut-rufous colouring, more or less deep, with the markings sometimes nearly obsolete, except the black tips of the ruff and under-scapularies, and some streaks on the breast and flanks, the belly and lower tail-coverts continuing white with the usual markings. The aigrettes (so far as we have seen) are always rufous in Indian specimens; and there is generally a strong tinge of this hue upon the wings. We continue to doubt whether *Scops spilocephalus*, nobis (*J. A. S.* xv. 8), should not rather be considered a distinct species, even after examination of a second specimen; and an *Ephialtes gymno-*

* *Sc. rutilus*, Pucheran, is from Madagascar; and M. Alfred Malherbe mentions a specimen from Algeria "d'un roux vif rayé de noir et de cendré." *Catal. Rais. d'Ois. de l'Algerie*, p. 8. An Algerian specimen sent by that gentleman to the Society's museum has a considerable admixture of rufous in its colouring.

podus, G. R. Gray, MS., from "India," is retained as distinct in Mr. Gray's second catalogue of the *Raptores* in the British Museum.

85. SC. SUPERCILIARIS? (*Pl. Col.* 21 ?).*

SYN. *Strix superciliaris* (?), Vieillot (vide *Rev. Zool. &c.*, 1849, p. 19).

S. rufescens, Horsfield.

S. Sonneratii (?), Temminck.

Ephialtes sagittata, Cassin.

HAB. Malayan peninsula and archipelago. (Not India.)

86. SC. LEMPIJI (*Pl. Col.* 99).

SYN. *Strix lempiji*, Horsfield.

S. noctula, Reinwardt.

Scops javanicus, Lesson.

Sc. lettia, Hodgson.

Sc. lettiioides et *griseus*, Jerdon.

Lempiji, Java (Horsfield); *Tharkusi Chugad*, or *Lattya*

Kudyal, Nepal (Hodgson).

HAB. In different varieties, India, China (?), and the Malay countries.

Remark. Specimens of this bird from the sub-Himalayas, Asám, Sylhet, Arakan, and the Tenasserim provinces, are generally (but not always) larger than those from S. India and Ceylon, while examples from the Malay countries are, for the most part, deeply tinged with rufous-brown.

Genus KETUPA, Lesson.

87. K. FLAVIPES.

SYN. *Cultrunguis flavipes*, Hodgson.

HAB. Himalaya only (so far as hitherto observed).

88. K. CEYLONENSIS (Hardwicke's *Ill. Ind. Zool.*)

SYN. *Strix ceylonensis*, Latham.

S. Leschenaultii, Temminck.

S. Hardwickii, Gray.

S. dumeticola, Tickell.

Cultrunguis nigripes, Hodgson.

* Unfortunately, we have never seen the *Planches Coloriées* of M. Temminck; the only copy in Calcutta being, to us, inaccessible.

Ūlu (generic), H. ; also *Amra ka Ghugu*, H. (Jerdon) :
Hutūm (generic), Beng. ; *Tee-dook*, Arakan (Phayre).

HAB. India generally ; Ceylon ; Asám ; Arakan ; Tenasserim provinces ; very common in Lower Bengal.

89. K. JAVANENSIS, Lesson (Tem., *Pl. Col.* 74).

SYN. *Strix ketupu*, Horsfield.

S. ceylonensis apud Temminck.

Tamba, or *Ketombo Ratanapye* ; *Hanta*, *Pelow*, Malay : *Blo ketupu*, Java.

HAB. Malayan peninsula and archipelago : rare in Arakan.*

Subfam. SURNINÆ.

Genus *ATHENE*, Boie.

90. *ATH. CUCULOIDES* (Gould's 'Century,' pl. 4).

SYN. *Noctua cuculoides*, Vigors.

N. auribarbis, Hodgson.

Dzee-gwet, Arakan (Phayre).

HAB. Himalaya ; Asám ; Arakan ; Tenasserim provinces ; China (Chusan).

91. *ATH. RADIATA*.

SYN. *Strix radiata*, Tickell.

Athene erythropterus, Gould.

Noctua perlineata, Hodgson.

N. cuculoides apud Jerdon, *Catal.*

Ath. undulatus apud Blyth, *J. A. S.* XI, 457.

Jungli Choghud, H. (Jerdon) : *Chotá Kál-panchá* ('small Death-Owl'), Beng. ; *Chugad*, Nepal (Hodgson).

HAB. Most parts of India ; Sub-Himalayan regions : never on the alluvium of the Gangetic delta, but appears immediately this is quitted in a westerly direction.

92. *ATH. MALABARICA*, Blyth, *J. A. S.* XV, 280.

SYN. *Ath. castanoptera* apud Jerdon, *Supp.*

HAB. Malabar.

* Mr. Cassin gives "India" as the locality for a specimen of this bird : but we have never heard of its occurrence on the western side of the Bay of Bengal, and know but of one instance of its being obtained so high as in Arakan.

93. **ATH. CASTANOTUS**, Blyth, Museum Catalogue.
 SYN. *Ath. castanoptera* apud Blyth, *J. A. S.* XV, 280.
Pancha Bassú ('small Owl'), Cingh.
 HAB. Ceylon (where common).*
94. **ATH. BRODIEI**.
 SYN. *Noctua Brodiei*, Burton.
N. tubiger et *Athene badia*, Hodgson.
 HAB. Himalaya.
95. **ATH. BRAMA** (*Pl. Col.* 68).
 SYN. *Strix brama*, Temminck.
Noctua indica, Franklin.
N. tarayensis, Hodgson.
Káturiá Pencha, ('wood-Owl,' i. e. that hides in cavities of wood), Beng.; *Khukhusat*, Upper Hindustan; *Chugad*, or *Choghud*, H.; *Pungla*, Mahratta.
 HAB. India generally to foot of Himalaya; Asám; Sylhet; extremely common in Lower Bengal: Persia (as about Erzeroum).†
 Genus **NINOX**, Hodgson.
96. **N. SCUTELLATUS** (*Pl. Col.* 289).
 SYN. *Strix scutellata*, Raffles.
S. hirsuta, Temminck.
S. lugubris, Tickell.
Ninox nipalensis, Hodgson.
Athene malayensis, Eyton.
Kúl Pencha ('Death-Owl'), Bengal: *Choghud Besra* ('Hawk Owl'), H. (Jerdon): *Kheng-boop*, Arakan (Phayre): *Raja Wali*, Malayan.
 HAB. India generally; Ceylon; Burmese and Malay countries:

* The Malayan *Ath. castanoptera*, (Horsfield, v. *spadicea*, Reinwardt), is mentioned as an inhabitant of the Tenasserim provinces by Dr. Helfer, and he is probably correct; but as Nos. 91, 92, and 93, are nearly affined to *Ath. castanoptera*, we must consider the Tenasserim species as needing satisfactory determination.

† **ATH. PSILODACTYLA**, (L., apud Boie), v. *Strix noctua*, Retzius, *S. nudipes*, Nilsson, *S. passerina* apud Latham and Temminck, *Ath. bactrianus*, Blyth, *J. A. S.* XVI, 776, &c., inhabits middle Asia, as Afghanistan and Tibet, but does not appear to have been observed in the Himalaya. *Strix persica*, Vieillot, is probably a variety. Vide *Rev. Zool. &c.* 1849, p. 18.

not rare in Lower Bengal. Madagascar (Dr. A. Smith, *Afr. Zool.*, p. 163).

Genus SYRNIUM, Savigny.

97. *S. INDRANI* (Gray's *Ill. Gen. Birds*, pl. 14).

SYN. *Strix indranee*, Sykes.

Ulula? et *Bulaca newarensis*, Hodgson.

Bulaca monticola, Jerdon.

Newar, Nepal (Hodgson); *Loco Bassa* ('large Owl'),
Cingh. (Layard).

HAB. Mountainous parts of India generally; Ceylon; Tenasserim provinces; Malayan peninsula.

Remark. We are strongly inclined to suspect that there exist two races of this bird, one of larger size peculiar to the Himalaya, the other alike in Central and S. India, Ceylon, and the Malayan peninsula.

98. *S. SELOPUTO* (Tem., *Pl. Col.* 230).

SYN. *Strix seloputo*, Horsfield.

S. pagodarum, Temminck.

HAB. Tenasserim provinces; Nicobar islands; Malayan peninsula and archipelago.

99. *S. SINENSE?* (Hardw., *Ill. Ind. Zool.*)

SYN. *Strix sinensis* (?), Latham.

S. orientalis, Shaw.

Syrnium ocellatum, Lesson.

HAB. Most parts of India, to foot of Himalaya: not Lower Bengal (at least below the tideway of the rivers). China?

100. *S. ALUCO?* (Himalayan variety).

SYN. *Strix aluco* (?) et *S. stridula* (?), Gmelin, &c. &c.

Syrnium nivicolum, Hodgson.

HAB. Himalaya: Europe; N. Africa; Asia Minor (Strickland); Japan (Temminck).

Remark. On comparison of numerous specimens both from Europe and different parts of the Himalaya, and varying much in plumage from both regions, we can no longer regard them as referable to more than one variable species, although Himalayan examples may generally be distinguished by their darker hue, and the usually greater development of the transverse markings of the plumage.

Subfam. STRIGINÆ.

Genus PHODILUS, Is. Geoffroy.

101. PH. BADIUS (Horsfield's
- Zool. Res. in Java*
- , pl.).

SYN. *Strix badia*, Horsfield.*Wowo-wiwi*, or *Kalong-wiwi*, Java.

HAB. Nepal; Sikim; Asám; Arakan; Tenasserim provinces; Malayan peninsula and archipelago.

Genus STRIX, L. (as restricted).

102. STR. JAVANICA, de Wormb (Gray's
- Ill. Gen. Birds*
- , pl. 15).

SYN. *Str. flammea* of India and the Malay countries, auctorum.

HAB. S. E. Asia and its archipelago. Very common throughout India.

Remark. This species is distinguished from *Str. flammea*, L., by its larger size and especially by its more robust feet and toes.

Genus GLAUX, Blyth.

103. GL. CANDIDA (Jerdon's
- Ill. Ind. Orn.*
- pl. 30).

SYN. *Strix longimenbris*, Jerdon.

HAB. Plains of India; common: very rare on the mud-soil of Lower Bengal.

NOTE. Since the conspectus of Indian FALCONIDÆ was published, the author has received several standard works from Europe, among which are the valuable publications of Dr. Rüppell, *the 'Manuel d'Ornithologie' of M. Temminck (ed. 1840), and the more recent Manual of European Ornithology of M. Degland. The following remarks occur on reference to these and other works.

FALCO LANARIUS, Schlegel, apud Degland, is by both of these authors identified with *F. Fieldeggii*, Schlegel, the African species which Mr. Strickland considers to be the same as *F. biarmicus* v. *peregrinoides*, &c. &c. (vide p. 319); and is not therefore the Indian *F. JUGGUR* (our No. 17), the adult and young of which have been figured by this name in Gould's 'Birds of Asia.' Dr. Rüppell, in his list of the *Falconidæ* of N. E. Africa (1845),* retains as separate species *F. peregrinoides*, Tem., and *F. biarmicus*, Tem., referring the latter to the subdivision *Tinnunculus*, while he assigns *F. chicquera* to *Falco*;†

* 'Systematische Uebersicht der Vögel Nord-ost Afrikas,' &c., p. 11.

† Dr. Rüppell unites *Hypotriorchis* and *Tinnunculus*, as indicated by his plac-

and it is remarkable that he does not include *Hypotriorchis subbuteo* in the list, though a migratory bird in Europe, and mentioned by Dr. A. Smith to occur at the Cape of Good Hope.

No. 19. There is a *FALCO PUNICUS*, Levaillant, "Exploration Scientifique de l'Algérie, *Oiseaux*, pl. 1, 1847" (as cited by Mons. A. Malherbe), which may perhaps be *F. peregrinator*. Dr. Hartlaub is disposed to think it a local variety of *F. peregrinus*.*

No. 42. As it seems doubtful whether No. 41 is not the true *ACCIPITER VIRGATUS*, (Tem.), of the Malay countries, a note of doubt should be placed after this habitat as assigned to No. 42.

No. 61. As far as can be judged from Dr. Rüppell's figure of *BUTEO RUFINUS*, this certainly would not seem to represent the common Indian Buzzard; but we may suppose that Mr. G. R. Gray has good authority for the identification, although it does not appear from his last catalogue of the British Museum *Raptores*, that there is an African specimen of this bird in the national collection.

No. 71. We can find nothing in the descriptions of *MILVUS ATER* by M. Degland and others, which does not apply to the Indian *M. govinda*, and bear out Mr. Strickland's opinion of their identity. In *Proc. Zool. Soc.* for 1834 or 1835 (we are necessitated to quote from memory), a recent specimen of *M. ater* shot at Erzeroum or Trebizond is described to have had orange-brown (?) irides, whereas those of the Indian Kite are dark brown.

P. 317. The prior name *BAZA*, Hodgson, should be substituted for *Aviceda*, Swainson, among the *Perninæ*.

Summary View of the Indian RAPTORES, considered in relation to those of other regions. On glancing over the list of Indian raptorial birds, the faunist, familiar with European ornithology, cannot fail to be struck with the number of European species of *DIURNÆ* which likewise inhabit India:—all, in fact, with the exceptions of a few stragglers from Africa or America, the Jer Falcons of the north (and even one of these we have admitted, on what appears to be satisfactory

ing *F. concolor*, Tem., in the latter.—Since writing the above, we have been fortunate in obtaining a live specimen of *F. chicquera*, observation of which inclines us now to regard it as an aberrant *Tinnunculus*,—certainly not a *Hypotriorchis*.

* "Bericht über die Leistungen in der Naturgeschichte der Vögel während des Jahres 1847," p. 14.

native testimony, as an exceedingly rare visitor in the N. W.), and finally *Haliaetus albicilla*, *Milvus regalis*, *Archibuteo lagopus*, and *Tinnunculus æsalon*. The two last mentioned are known only as winter visitants in S. Britain, but all are more or less seen in N. Africa, and it is remarkable that *Archibuteo lagopus* is likewise met with at the Cape of Good Hope. We believe, too, that all of these are found throughout northern Asia. Certain European species, however, as *Pernis apivora*, are severally replaced in India by closely affined races (perhaps not in all instances distinguishable); and the same is perhaps the case with *Milvus niger*, and would have been averred of *Buteo vulgaris*, only that the latter would itself appear to inhabit a loftier elevation than the common Indian Buzzard on the Himalayas and likewise the Nilgiris. With the NOCTURNÆ, on the contrary, the species appear to be throughout distinct in the two regions, save only *Asio otus* and *A. brachyotus*, and *Scops Aldrovandi* and *Syrnium aluco*; though both of the latter are, in general at least, so far distinct in their plumage, that the Indian race of each may be regarded as a marked variety, or as one of the many instances in which it is not likely that zoologists will ever be agreed about considering as a distinct species or not. Again, of these four, *Asio otus* and the *Syrnium* are confined to the Himalaya, the *Scops* is widely diffused, and *A. brachyotus* is an erratic winter visitor in the plains, by no means rare in Lower Bengal. Of the non-European Indian species of DIURNÆ, a few belong to the high table-lands of central Asia, and are little known on the Indian side of the Himalayan snows: such are *Archibuteo hemiptilopus* and *Buteo aquilinus* and *B. plumipes*. *Falco sacer* appears to be a rare mid-Asian bird, scarcely perhaps more frequent in the Himalaya than in E. Europe. Other species inhabiting Europe and northern Asia which in India would appear to be peculiar to the Himalaya, are *Aquila chrysaetos*, *Astur palumbarius*, and *Circus cyaneus*; also *Vultur monachus* and *Gyps fulvus*: and among the NOCTURNÆ (as before remarked) *Asio brachyotus* and *Syrnium aluco*, var.* It is remarkable that there is not a single raptorial species common to India and Australia; unless, indeed, the Indian Kite may yet prove to be identical with *Milvus affinis*, Gould, *Falco peregrinator* with *F. melanogenys*, Kaup,

* Perhaps also *Bubo maximus* and *Athene philodactyla*. *Gypaëtus barbatus*, var., should perhaps be in like manner substituted for *G. himachalanus*.

and *Baza Reinwardtii* with *B. subcristata*, Gould: but many are common to India and the great Indonesian archipelago, and some to both of these regions and to Africa. Our list contains a few which are exclusively Malayan or Indonesian, *e. g.* *Baza Reinwardtii*, *Accipiter nisoides*, *Spizaëtus alboniger*, *Pontoaëtus humilis*, and *Scops superciliaris* (? v. *rufescens*): other Malayan species reach only (so far as known) to the Tenasserim provinces, as *Hierax fringillarius*, *Buteo pygmaeus* (?), and *Syrnium seloputo*; or still further to Arakan, as *Ketupa javanensis*; or again further to the S. E. Himalaya, as *Phodilus badius*; or the Himalaya generally (visiting the plains of Bengal and Upper India in winter), as *Hypotriorchis severus*. Of species more or less common to all India (in suitable localities) and Indonesia, being moreover peculiar to these regions, may be enumerated *Falco peregrinator* (?), *Pernis cristata*, *Astur trivirgatus*, *Accipiter virgatus* (? *besra*), *Micronisus badius*,* *Spizaëtus cirratus*, var., *Ictinaëtus malaiensis*, *Poliornis teesa*,† *Pontoaëtus ictinaëtus*, *Haliaëtus Maccei* (?), *Haliastur indus*, and *Milvus govinda* (?); also *Otogyps cdæus* (?) and *Gyps indicus*: and among the NOCTURNÆ, *Bubo orientalis*, *Scops lempiji*, *Syrnium indrani*, and *Strix javanica*. Others, again, are common to those two regions and to Africa, as *Elanus melanopterus*, *Hæmatornis cheela* (*bacha*?), *Blagrus leucogaster*, *Gyps bengalensis*, and *Ninox scutellatus* (Madagascar); or to India and Africa exclusive of Indonesia (?), as *Tinnunculus chicquera*, *Aquila nævioides*, and *Buteo rufinus* (?); to which may be added (though European rarities), *Circaëtus gallicus*, *Circus Swainsonii*, and *Hieraëtus pennatus*.

The species of raptorial birds peculiar to India are remarkably numerous, especially among the NOCTURNÆ; those, at least, which at present are only known to inhabit India. Some are very local, as *Athene castanotus* in Ceylon, *Ath. malabaricus* on the Malabar coast, *Ath. Brodiei* and *Ketupa flavipes* in the Himalaya; and of the three remaining species of *Athene*, *Ath. radiata* is also peculiar but more generally diffused, *Ath. brama* extends into Persia, and *Ath. cuculoides* is the only one we have seen from the eastern side of the Bay of Bengal, though in India it is confined to the Himalaya, and it spreads eastward

* Found also in Afghanistan.

* Or this should rather be considered a true Indian species, which extends its range into the Malayan peninsula and probably not much beyond.

so far as Chusan, and southward to the Tenasserim provinces.* Other fine Owls peculiar to India (or nearly so), are *Bubo bengalensis* and *B. coromander*, *Ketupa ceylonensis*, and *Syrnium sinense*, pretty generally diffused, and the *Ketupa* only appearing (so far as we have seen) on the eastern side of the Bay of Bengal; *Glaux candida* is found chiefly in Central India and parts of Upper Bengal. Not one of these species appears to be known in the Malay countries, and we are aware of only *Bubo bengalensis* having been met with in Afghanistan. Of *Syrnium indrani* we have seen three examples from Malacca, whence may be inferred that this Indian species is there not rare, and probably also inhabits some of the islands. Of *DIURNÆ*, the Himalayan *Lammörgeyer*, if not distinct, is certainly a well marked variety, found also in Afghanistan. Among the *Falconidæ*, so far as we at present know, the following species are peculiar to India. *Falco juggur*, *Baza lophotes*, *Spizaëtus Kieneri*, *Aquila hastata*; the long-crested race of *Spizaëtus cirratus*; *Accipiter virgatus* (? *besra*); *Circus melanoleucos*, which inhabits all India and Ceylon, with Arakan and the Tenasserim provinces; *Hierax eutolmos*, from Nepal and Asám to Tenasserim; *H. melanoleucos*, Asám; *Spizaëtus nipalensis*, Himalaya and mountains of Ceylon, and perhaps identical with a Japanese species, as suggested by Mr. G. R. Gray. The genus *Hierax* occurs only in the N. E. extremity of India; and the various large fishing Eagles, excepting the Osprey, and perhaps *Blagrus leucogaster*, appear to be little known in S. India.

Several of the non-European *Falconidæ* of India are distinguished by an occipital crest, either rudimental or developed to a considerable length, and which is commonly held erect or nearly so; it is also generally accompanied by a peculiar style of marking of the plumage, exemplified especially by the three gular lines from which *Astur trivirgatus* takes its name.† These crested *Falconidæ* are *Pernis cristata*, *Baza lophotes* and *B. Reinwardtii*, *Astur trivirgatus*, the different *Spizaëti*, and *Hieraëtus pennatus* rudimentally; some of which birds, as the first three and the rest respectively, exhibit little mutual affinity in other particulars.

(To be continued.)

* The Tenasserim *Ath. castanoptera* apud Helfer is in need of further determination.

† *Accipiter virgatus* (? *besra*) and *nisoides* exhibit the same gular lines unaccompanied by an occipital crest.

Additional Notice of the Shou or Tibetan Stag.—By B. H.
HODGSON, Esq.

Since my recent account of the Tibetan Stag was submitted to the Society I have been enabled, through Dr. Campbell's kindness, to examine another specimen consisting of a nearly complete head and horns with the skin on, and inclusive of the skull, which however wants the lower jaw. These are the spoils of a male, and a mature or rather aged male, as is evidenced by the inferior size of the horns, by the partially obliterated sutures of the skull, and by the well-worn canine teeth; and, as this magnificent animal is a tenant of one of the strangest and most interesting regions of the earth, I need make no apology for devoting a few more lines to the description of this second, and in some respects superior, sample of it. The skin is not entirely separated from the skull, nor am I permitted wholly to remove it; but the specimen, as it stands before me, affords satisfactory means of testing the characters, and obtaining most of the dimensions, of both head and skull, and I shall accordingly give a summary notice of both, in completion of my prior paper on the Shou.

The head with its integuments is about 18 inches long, of straight measurement from the snout to the occipital jut, and about 7 inches wide between the salient angles of the brows which project more to the sides than do the cheek bones and consequently exhibit the maximum of breadth. The bridge of the nose inclines to a curve or "Roman" shape. The forehead is broad and flat, seeming to have even a slight dip or depression before the bases of the horns. The muffle, or nude extremity of the nose, is small but distinct, smaller than in any congener I ever saw, but yet unmistakably developed. It occupies the space between the nostrils, and descends narrowing on the front of the upper lip, till at the margin or aperture of the mouth, the nude moist part of the lip is reduced to less than three quarters of an inch in breadth. The larmiers or suborbital fissures are of medial size, and nude inside as well as round their edges. They are much smaller than in the Rusas, but fully as large as in the Red Deer. The ears are remarkably long ($9\frac{1}{2}$ inches), narrow and pointed, and their copious lining of soft hair, not less than the limited muffle, indicates the extreme coldness of the animal's abode.



The Snow of Tibet. Cervus Affinis

The pelage, like that of every other strictly Himálayan and Tibetan ruminant, has, as is evident from the covering of this head, a harsh, brittle, quill-like character, and probably, on the body of the animal, also a wavy structure; for, on the head this last feature of such pelages is always wanting. The hair of the head is straight and copious, devoid, as usual, of the fine woolly subfleece proper to the body, and on the crown of the forehead it has a length of $3\frac{1}{2}$ inches. The colour of the hair, like its quality, is that so common to the ruminants of Tibet, namely, a purpurescent or embrowned slaty blue passing into paler or grey slaty on the less coloured parts, and terminated externally or tipped with fawn or luteous buff passing into canescent fawn. The orbits and lining of the ears are nearly or quite white, and the lips show a ruddy ochereous tinge void of any dark marks.

The skull, which is $17\frac{1}{2}$ inches long to the jut of the occiput and $6\frac{1}{2}$ inches wide between the outer angles of the orbits (in rectilinear measurements), has the frontals broad, flat and a little hollow before the bases of the horns; the orbits salient and extending laterally beyond the zygomatic arches; the nasals compressed and somewhat arched lengthwise; the cavities for holding the larmiers large and perforate, but less so than in the Rusas; the horn-pedestals low and thick; and, lastly, the occipital plane wide in proportion to its height, and oblate hemispherical in shape. The horns, of a size greatly inferior to those priorly given, originate remotely from each other below the summit of the frontals, spread very amply in their ascent, and recline a good deal before they begin to ascend. The colour of the horns is brown, and their surface is smooth. There are two basal, one central, and one terminal snags to each beam. The former or basal snags of each beam are proximate and parallel to each other, have an anteaal external insertion, and a horizontal direction, with the tips of all four bent uniformly upwards. The two inner ones lean directly over the eyes and side of the face, and the two upper and outer ones run, almost parallel, outside of the former which they somewhat exceed in size.

The central snag is the smallest of all, placed equidistantly from the lower and upper snags, inserted on the outside of the beam, and directed forwards and outwards with the lip reverted, as in the basal snags. The apical snag also starts from the outside of the beam, but has an upward direction and little divergency from the beam, which

is decidedly longer, though not thicker, than this terminal snag. The result is a simple fork instead of a crown of snags; and, this being my third fine specimen so characterised, I have now no doubt that the simply forked summit is normal as before conjectured; and also, that the species is identical with my affinis, the trivial differences therefrom, noticed in the prior sample of the Shou, being no longer forthcoming in this.

The subjoined sketches and measurements complete what I have to report respecting the present sample of this splendid Stag.

Dimensions of horns.

	Feet. Inch.
Greatest length, along curve,	3 10½
Girth just above burr,	0 7¾
Chord of arc or bend of beam,	1 0½
Basal interval between burrs,	0 4½
Terminal interval between apical snags,	3 9
Terminal interval between tips of beams,	2 6½

Dimensions of skull.

Length, from symp. interm. to jut of occiput, straight, ..	1 5½
Length from symp. interm. to fore angle of orbit,	0 10½
Thence to jut of occiput,	0 8
Greatest width between postear angles of orbits,	0 6½
Length of series of upper molars,	0 4¾
Interval of foremost molar and the canine,	0 3
Canine to front of jaw or symp. interm.,	0 2½
Diameter of orbit,	0 2½
Extreme length of nasals,	0 6½
Ditto. of frontals and parietals,	0 8½
Breadth of occipital plane,	0 5¾
Depth of ditto,	0 4
Teeth of upper jaw,	16 0

P. S. The present specimen was killed in the district of Chúmbi which is more wooded and less arid than most other districts of Tibet. To the north Chúmbi adjoins Phári and other parts of Ding-cham vel Damsén whence came the priorly described specimen of the Shou. Chúmbi is the basin of the Máchú vel Torsha river which rises from the western flank of Chúmalári.

*Translation of the "Vichitra Nátak" or "Beautiful Epitome,"—a fragment of the Sikh Granth entitled "the Book of the Tenth Pontiff."** By Captain G. SIDDONS, 1st Cavalry.

CHAPTER I.

THERE IS ONE GOD.

Oh good and holy One! by Thy favour I commence this beautiful Epitome of the verbal declarations of the ten pádsháhs.†

To Thy power I am obedient with my whole heart, and shall complete this work if thou deignest thine assistance.

THE PRAISE OF TIME.‡

Thou dwellest in Heaven and upon earth,
Thou destroyest armies of wickedness,
In war thou art ever victorious,

Ever Superior.

Thy power is not only great, but perfect,
Thy refulgence is incomparable,
Thy brilliancy is illimitable,

Equal to the Sun's.

Thou comfortest all who are virtuous,
Thou correctest every evil precept,
Thou puttest to flight all iniquity :

My hope is in thee.

Noble Creator of the world, all hail !

Who mercifully protectest the good,

Who bestowest thy favours upon me,

To thy second, all hail !

Even one brightness

Ungenerated,

God above all gods,

King above all kings

Incorporeal,

* N. B.—Govind Sing, the last of the Padshahs wrote this Book.

† The ten Pádsháhs or Gúró's are 1, Nának, 2, Angad, 3, Amaradás, 4, Rámadás, 5, Arjún, 6, Hargovind, 7, Harkishan, 8, Teghbahádúr, 9, Haráh, 10, Govind Sing.

‡ God the Supreme Being, is personified by काल or time.

And everlasting
Formless and spotless
Parent of each age.
Exterminator! I bow to thee.

Without body, unchangeable, eternal, boundless, never aged, peculiar, never infantile, never youthful, neither rich nor poor, invisible, unmarked, without colour, passionless, illimitable, without countenance, nameless, houseless, playing with fierce brilliancy, never hostile, without counterfeit, more devout than all Jogis, essentially pure. Invincible, fearless, desired by all, never-fated, undisguised without commencement, yet infinite, perfect, bearing no enmity, primeval, friendly, filled with abundance, glorious, tranquil, without affection, without deceit, impartial, chaste, amiable and omnipresent. Vast, pure, invincible, ancient, before all that has been and that will be, who knoweth neither sorrow, nor anger, always new, unborn, aiding, well acquainted with all things. Thou knowest of the past, the present and the future, obedience to thee, oh unchangeable One, never infirm. Obedience to thee, thou God of gods, thou King of kings, who desirest power from no one, thou eternal One, greater than all the potentates of the earth! Indescribable, inexhaustible, friendly, sanctified amongst saints, desiring nothing, the chief of every enjoyment.

Sometimes thou art as the principles of truth, of passion or of ignorance. Sometimes thou appearest as a man, sometimes as a woman, sometimes thou art as an angel, at others, as a devil; it often pleaseth thee to assume various forms. Sometimes thou blossomest as a lovely flower, or thou art a bee and goest thy way buzzing; sometimes thou speedest on the swift wings of the wind. How can I tell of thee who art indescribable?

Sometimes as an echo thou reverberatest pleasantly, now as a huntsman thou killest with arrows. Sometimes thou art a stag, which approaches the snare, sometimes thou art more beautiful than the God of Love. No one can tell what form it may please thee to assume, nor where thou residest, nor what disguise thou wilt choose to go about in, none can call thee by thy name. Alas! how can I tell of thee, who art indescribable? Thou, who hast no Father, nor Mother, nor brethren; nor sons, nor grandsons. Thou, who wast never nursed

